AD-A154 549 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS SANDWASH DAM (MA 0031.. (U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV AUG 81 1/2

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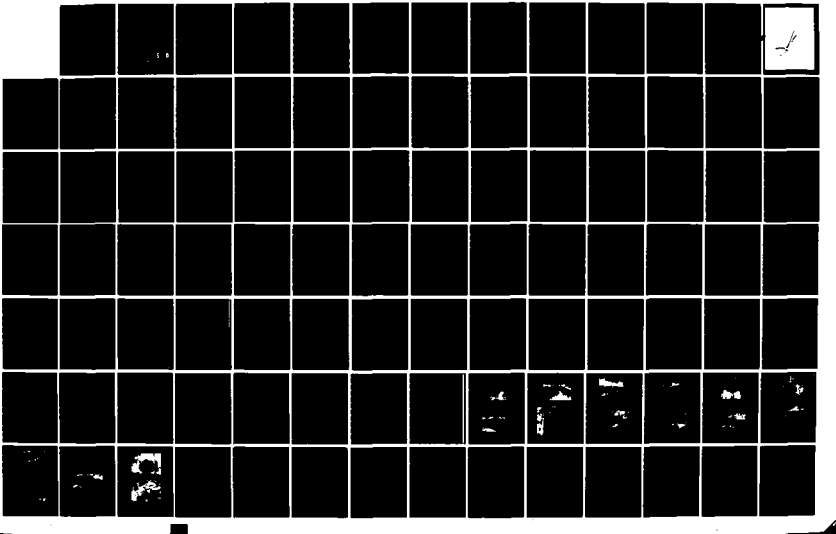

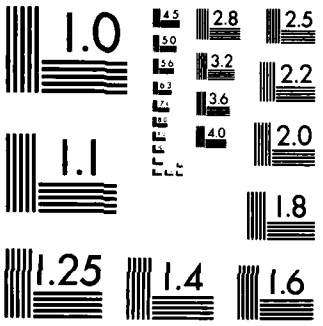

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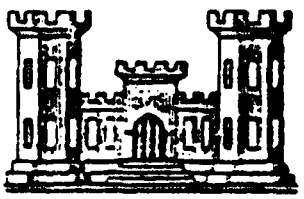
HOUSATONIC RIVER BASIN
WASHINGTON, MASSACHUSETTS

SANDWASH DAM
MA 00316

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

WALTHAM, MASS. 02154

AUGUST 1981

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER: MA 00316	2. GOVT ACCESSION NO: AD-A154549
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): Sandwash Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS	5. TYPE OF REPORT & PERIOD COVERED: INSPECTION REPORT
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254	12. REPORT DATE: August 1981 13. NUMBER OF PAGES: 49
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Housatonic River Basin
Wahington, Massachusetts
Tributary of Roaring Brook

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam is a 41 foot high, 1550 foot long embankment dam containing a concrete and masonry spillway and a gate structure. The dam appears to be in generally fair condition. It has a classification size of intermediate and a hazard potential of significant. There are various recommendations and remedial measures that should be implemented by the owner.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED

SEP 21 1981

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Sandwash Dam (MA-00316) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. This report is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. I approve the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is vitally important.

Copies of this report have been forwarded to the Department of Environmental Quality Engineering, and to the owner, City of Pittsfield. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Environmental Quality Engineering for your cooperation in this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

IDENTIFICATION:	MA 00316
NAME OF DAM:	Sandwash Dam
TOWN:	Washington
COUNTY AND STATE:	Berkshire County, Massachusetts
STREAM:	Tributary of Roaring Brook
DATE OF INSPECTION:	July 1, 1981

The dam is a 41 foot high, 1550 foot long embankment dam containing a concrete and masonry spillway and a gate structure. The dam is owned and operated by the City of Pittsfield. The dam was built in 1936 and its purpose is water supply.

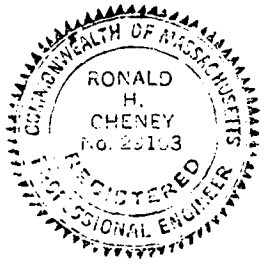
The visual inspection indicated the dam to be in generally fair condition. Evidence of seepage was observed at the intersection of the left abutment and downstream slope and at the downstream toe. Subsidence of the crest was observed near the right spillway training wall. Trees were observed near the downstream toe. The spillway weir and training walls are in need of repair.

The dam has a size classification of intermediate and a hazard classification of significant. Based upon Corps Guidelines, the PMF test flood inflow would be 3400 cfs, from the 1.7 square mile drainage area. The routed test flood discharge is 2610 cfs with a corresponding surcharge elevation of 1899.5. The top of dam, elevation 1901, is not overtopped. The spillway has a capacity of 5135 cfs. The test flood outflow would equal about 50 percent of the spillway's capacity.

The Owner should engage a qualified registered professional engineer to investigate and design required remedial measures for: the source of seepage along the left abutment and at the downstream toe; the crest subsidence near the right spillway training wall; means of removing and backfilling trees and roots.

Furthermore, the Owner should institute remedial measures which should include: removal of brush and trees on the side slope, in the spillway and outlet discharge channels and at the outlet structure; repair of the concrete on the crest of the spillway weir; repair of the capstones at the spillway training walls; development of a formal warning system and a program of annual technical inspection.

The recommendations and remedial measures should be implemented by the Owner within one year of receipt of this Phase I Inspection Report.



Ronald H. Cheney, P.E.
Vice President

Hayden, Harding & Buchanan, Inc.
Boston, Massachusetts

This Phase I Inspection Report on **Sandwash Dam (MA-00316)** has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH W. FINEGAN, JR., CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions wnich might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to

represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does <u>not</u> include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

TABLE OF CONTENTS

b. Adequacy

The lack of indepth engineering data does not allow for a definitive review. Therefore, the adequacy of this dam, structurally and hydraulically, can not be assessed from the standpoint of review of design calculations, but must be based primarily on the visual inspection, past performance history, and sound engineering judgement.

c. Validity

The visual inspection of this facility showed no reason to question the validity of the other information supplied on the plans and the State and County Inspection Reports.

SECTION 2

ENGINEERING DATA

2.1 Design Data

Contract drawings, dated November 1935, plans dated April 24, 1936 which indicate that they supersede the contract drawings, and contract drawings for the outlet works downstream of the pipe tunnel dated July 9, 1936 were obtained from the Pittsfield Engineering Department. No design calculations were located.

2.2 Construction Data

Three design sheets dated April 24, 1936, indicate changes from the original design. These plans probably represent as-built drawings. No other construction data was located.

2.3 Operation Data

No operational manual exists for this dam.

2.4 Evaluation of Data

a. Availability

Contract drawings dated November 1935, April 24, 1936 and July 9, 1936 were made available at the Pittsfield Engineering Department. State Inspection Reports for the years 1971, 1972, and 1976 and a 1966 County Inspection Report were made available at the Department of Environmental Quality Engineering, Division of Waterways, Boston Office.

j. Regulating Outlets

The only regulating outlet at Sandwash Dam is at the gate structure. It contains 3 manually operated gate valves to regulate inflow from the upper and lower intakes (see Section 1.2.b. and plan B-5). It also contains 2 manually operated sluice gates to control discharge into the 18 inch outlet and 8 inch sleeve. The 8 inch sleeve terminates at the pipe tunnel. The 18 inch outlet discharges at the downstream headwall at about invert elevation 1846.

f. Reservoir Surface (acres)

(1) Spillway crest ---------- 65

(2) Normal pool ---------- 65

(3) Top of dam ---------- 130

(4) Test flood pool ---------- 114

(5) Flood control pool ---------- N/A

g. Dam

(1) Type ---------- earth embankment

(2) Length ---------- 1550'

(3) Height ---------- 41'

(4) Top Width ---------- 10'

(5) Side Slopes(Upstream above El. 1881)-- 2-1/2H:1V
(Upstream below El. 1881)-- 3-1/4H:1V
-(Downstream) ---------- 2H:1V

(6) Zoning ---------- Not indicated

(7) Impervious Core ---------- Concrete corewall

(8) Cutoff ---------- Concrete corewall

(9) Grout curtain -------- plans indicate corewall to solid ledge

h. Diversion and Regulating Tunnel - None on this project

i. Spillway

(1) Type ---------- Ogee weir

(2) Length of weir ---------- 90'

(3) Crest elevation ---------- 1895

(4) Gates ---------- None

(5) U/S Channel-(none) ------- opens directly to lake

(6) D/S Channel ------- rocklined trapezoidal channel

9. Total Project Discharge at Test Flood Elevation

The total project discharge with the reservoir level at the test flood elevation of 1899.5 and the 18 inch pipe open would be 2640 cfs.

c. Elevation (feet above NGVD, elevations are approximate)

(1)	Streambed at toe of dam	1860
(2)	Bottom of cutoff	varies
(3)	Maximum tailwater	Unknown
(4)	Recreation pool	N/A
(5)	Full flood control pool	N/A
(6)	Spillway crest	1895
(7)	Design surcharge (Original Design)	Unknown
(8)	Top of dam	1901
(9)	Test flood surcharge	1899.5

d. Reservoir (Length in feet)

(1)	Normal pool	2700
(2)	Flood Control pool	N/A
(3)	Spillway crest pool	2700
(4)	Top of dam	6900
(5)	Test flood pool	6700

e. Storage (acre-feet)

(1)	Spillway crest pool -- (elevation 1895)	804
(2)	Normal pool ---------- (elevation 1895)	804
(3)	Top of dam ---------- (elevation 1901)	1390
(4)	Test flood pool ---- (elevation 1899.5)	1255
(5)	Flood control pool	N/A

2. Maximum Known Flood at Dam Site

There are no records of the maximum flood at the dam. The United States Weather Bureau records indicate that about 4 to 6 inches of rainfall occurred near the general location of the dam during the period of August 11 to 15 and again from August 17 to 20, 1955.

3. Ungated Spillway Capacity at Top of Dam

The capacity of the spillway is 5135 cfs with the level of the reservoir at elevation 1901, top of dam.

4. Ungated Spillway Capacity at Test Flood Elevation

The capacity of the spillway is 2610 cfs with the level of the reservoir at the test flood elevation 1899.5.

5. Gated Spillway Capacity at Normal Pool Elevation

Not Applicable.

6. Gated Spillway Capacity at Test Flood Elevation

Not Applicable.

7. Total Spillway Capacity at Test Flood Elevation

The capacity of the spillway is 2610 cfs with the level of the reservoir at the test flood elevation 1899.5.

8. Total Project Discharge at Top of Dam

The total project discharge with the reservoir level at top of dam and the 18 inch pipe open would be 5165 cfs.

passes through a swamp area before it inlets into Sandwash Reservoir on the western shore. The only road is West Branch Road which is undeveloped within the drainage area.

b. Discharge at Dam Site

1. Outlet Works

There are two major outlets from Sandwash Dam. They are the 18 inch outlet pipe and the spillway. The 18 inch outlet is manually controlled from the gate structure. It discharges from a stone masonry headwall structure located approximately 200 feet downstream from the toe of the dam. It has a capacity of 30± cfs with the reservoir level at elevation 1901, top of dam. Plans indicate flow can be diverted into an aerator structure, prior to discharging through a 16 inch effluent from the headwall structure. The invert elevation at the headwall is approximately 1846.0.

The concrete and masonry spillway is located near the center of the dam. It is about 90 feet long and has no provisions for stoplogs or flashboards. The elevation of the spillway crest is 1895. The spillway outlet channel is located approximately 600 feet right of the 18 inch outlet channel. The two channels join approximately 1400 feet downstream from the toe. The combined discharge then enters an open flow adqueduct which flows parallel to Roaring Brook for approximately 1,500 feet. Here the aqueduct ends and there is a diversion structure which can direct discharge into Farnham Reservoir or Roaring Brook.

h. Design and Construction History

Sandwash Dam was designed in 1935 through 1936. The design plans indicate Samuel M. Ellsworth as the consulting engineer. The dam was built in 1936. No information regarding construction was located. However, three design sheets dated April 24, 1936 indicate several design changes from earlier dated plans. These plans probably represent as-built drawings. (Elevations shown on these plans are those presented on plans in Appendix B). A County Inspection Report dated 1966 indicates that in 1956, "Masonry was pointed up." This is the only information related to the repair of the dam that was located.

i. Normal Operational Procedures

The dam is a water supply facility that serves primarily as a supply source for downstream Farnham Reservoir. The outlet structure is regulated according to the level of Farnharm Reservoir. The Water Department attempts to keep Farnham Reservoir full at all times. When the level of Farnham drops it is supplemented by discharge from Sandwash. The aerator structure has not been used in many years. The spillway weir is ungated and has no provisions for flashboards.

1.3 Pertinent Data

a. Drainage Area

The 1.7 s.m. (1073 acres) drainage area is located within October Mountain State Forest, Washington, Massachusetts. It is made up of mountainous, undeveloped, wooded land. There is only one unnamed brook located within the drainage area. It

c. Size Classification

The dam is classified as intermediate based on its height of 41 feet and storage capacity of 1,390 acre-feet. The Corps Guidelines for an intermediate size dam are a height of 40 to 100 feet and a storage capacity of 1000 to 50,000 acre-feet.

d. Hazard Classification

The dam has a significant hazard potential due to the potential loss of a few lives from an assumed dam failure flood. It is estimated that within the area studied, approximately 1 home and 3 roads would be impacted if the dam were to fail. Flood stage could reach depths of 2 feet above the first floor level at the home. The maximum failure discharge is estimated to be 47,720 cfs. Prior to dam failure flooding, base flow flood depths could be about one foot deep.

e. Ownership

The dam has been owned by the City of Pittsfield since it was constructed.

f. Operator

The dam is maintained and operated by City of Pittsfield Water Department. Mr. Paul J. Pierce is the Superintendent. The address of the Water Department Office is Tyler Street, Pittsfield, Massachusetts 01201. The telephone number is (413) 443-6112.

g. Purpose of Dam

The purpose of the dam is water supply.

tunnel. The 8 inch sleeve outlets directly into the tunnel. The pipe tunnel extends 107 feet from the centerline of the dam and was originally built to divert Sandwash Brook under the embankment during construction. The 18 inch outlet pipe continues approximately 200 feet downstream from the end of the tunnel and enters a control chamber (photograph 16). Plans indicate that flow can be directed at the control chamber through an 18 inch by-pass line to the outlet headwall structure or diverted to a 42 foot diameter aerator structure. See photograph 17 and plan B-3. The aerator has a 16 inch effluent line which also outlets through the stone masonry headwall at invert elevation 1846 (photograph 9).

The 18 inch inlet pipe has two control gates into the well structure and the 24 inch inlet has one. The 18 inch and 8 inch outlets are controlled by sluice gates. See plans B-3 and B-5.

Plans indicate that an ungated 8 inch cast iron drain also discharges from the pipe tunnel into a drain outlet approximately 70 feet downstream from the tunnel. A catch basin located about 155 feet downstream from the toe, discharges at the outlet structure through an 8 inch vitrified clay drain. Plans also indicate that a 4 inch drain from the control chamber and a 6 inch drain from the aerator discharge from a small masonry headwall structure located approximately 100 feet downstream from the headwall structure shown by photograph 8. All discharge from the dam is into the Roaring Brook.

contains a 3 foot wide berm at elevation 1881 and the riprap toe is 5 vertical feet high. The upstream face is inclined at 2 1/2 H:1V to elevation 1881 where it flattens out to 3 1/4 H:1V.

Design plans indicate the dam to have a continuous central concrete corewall founded in a cutoff trench on bedrock. The top of the corewall is one foot below the crest.

The spillway is 90 feet long and contains a concrete weir. The elevation of the top of weir is 1895. There are no provisions for stoplogs or flashboards. The spillway training walls are concrete with a stone masonry facing and conform to the side slopes of the dam. See photograph 12 in Appendix C. The spillway channel is ripraped on the upstream side and the downstream apron is composed of stone and soil with thick vegetation (photograph 5).

The gatehouse structure is located approximately 250 feet right of the left abutment. It is 13 foot square brick and granite stone structure, containing the manually operated intake and outlet controls. The gate structure contains a 9 foot square well which extends to elevation 1858. There are 2 intake levels entering the well. The upper level intakes at invert elevation 1874.7. It consists of a 18 inch pipe and an intake structure located about 95 feet upstream of the gatehouse. The lower level intakes at invert elevation 1859.3 and consists of a 24 inch pipe and an intake structure located approximately 150 feet upstream of the gatehouse (See Plan B-3). The outlets from the gate structure consist of an 18 inch pipe and an 8 inch pipe sleeve. The 18 inch outlet travels through a 5 foot wide downstream pipe

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

Sandwash dam is located in the Town of Washington, in Berkshire County, Massachusetts. The dam inpounds the waters of Sandwash Reservoir which is fed by a tributary of Roaring Brook. Downstream of the dam, Roaring Brook flows west, approximately 4.5 miles to reach the Housatonic River in Lenox, Massachusetts. The dam is shown on the East Lee, Massachusetts U.S.G.S. Quadrangle, having the approximate coordinates of North 42° 22' 00", West 73° 10' 18".

b. Description of Dam and Appurtenances

Sandwash Dam is a 41 foot high, 1550 foot long earth embankment dam containing a concrete and masonry spillway and a gatehouse structure. The earth embankment is separated into two sections by the spillway. The right section is approximately 650 feet long. It is turf covered on the 10 foot wide crest and downstream face. The upstream face is riprap covered and is inclined at 2 1/2 H:1V. The downstream face is inclined at 2H:1V and contains a riprap toe for the lower 3 1/2 vertical feet (see plans in Appendix B).

The left embankment section is approximately 810 feet long. It also is turf covered on the crest and downstream face and the upstream face is riprap covered. It has a 10 foot wide crest and the downstream face is inclined at 2H:1V, however, it

PHASE I

NATIONAL DAM INSPECTION PROGRAM

SECTION 1
PROJECT INFORMATION

1.1 General

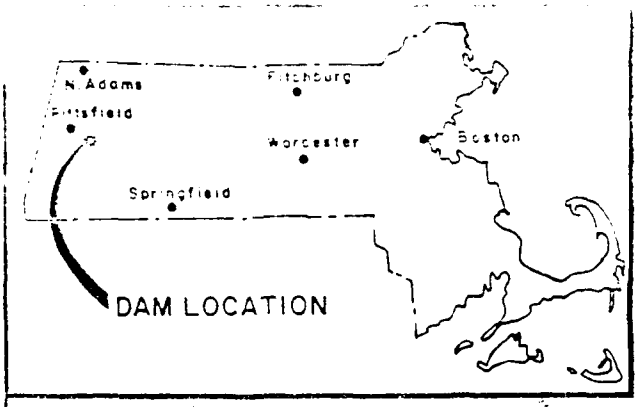
a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Hayden, Harding & Buchanan, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Hayden, Harding & Buchanan, Inc. on 26 June, 1981 by William E. Hodgson Jr., Colonel, Corps of Engineers. Contract No. DACW 33-80-C-0006 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) Perform technical inspection and evaluation of nonFederal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to initiate quickly, effective dam safety programs for non-Federal dams.



HAYDEN, HARDING & BUCHANAN, INC. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

SANDWASH DAM
LOCATION PLAN

WASHINGTON — MASSACHUSETTS

			SCALE 1:25000
			DATE AUGUST, 1981

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General

The dam was visually inspected on July 1, 1981. At the time of the inspection, the level of the reservoir was at the spillway crest.

b. Dam

The dam is an earth embankment 41 feet high, 1550 feet long and 10 feet wide at the crest. The dam axis forms a wide V-shape between abutments with the point of the V pointing downstream. See plan B-3.

The design drawings indicate that the dam has a continuous central concrete corewall, upstream riprap protection over the entire slope, and a downstream rock toe.

A spillway is located near the center of the dam where bedrock is partially exposed in the channel floor.

1. Upstream Slope

The upstream face of the dam is sloped at 2 1/2H:1V above elevation 1881 and 3-1/4H:1V below elevation 1881 based on the design drawings and field measurements above the water level. The visible riprap was generally in good condition on both the left and right sections of tne dam, as shown in photographs 1 and 3, respectively. Some small brush is growing on these slopes.

One area of subsidence of the upstream slope is apparent near the crest adjacent to the right training wall of the spillway, as shown in photograph 12. Subsidence on the order of 1 foot has occurred in this area.

2. Crest

The dam crest is grass covered and well maintained with no sign of movement or cracking The crest of the right and left sections of the dam are shown in photograph 15 and 10 respectively. The only area of subsidence is that shown below the ruler in photograph 12 discussed above.

3. Downstream Slope

The downstream face of the dam is sloped at 2H:1V with a 3 foot wide berm at elevation 1881. The rock toe shown on the design drawings was observed in some areas but was not apparent in others. Even where it could be seen, it was overgrown with turf.

The slope is generally turf covered and well maintained except at the intersection of the slope and left abutment and along the entire toe of the right half of the dam, where heavy tree growth is present. General views of the downstream face of the left and right sections of the dam are shown in photographs 6 and 11 respectively.

Seepage on the order of a few gallons per minute is present at the intersection of the slope and left abutment about 145 feet south of the gate structure. The seepage is shown in photograph 13. The seepage is

generally covered by trees but has created a stream eventually leading to the outlet structure located about 200 feet downstream of the toe of the dam. At the point where the seepage appears, the water is rust colored and hence the presence of soil particles in the water could not be observed.

Along the toe of the right half of tne dam, several wet areas were observed. The most significant area, shown in photograph 14, is located about 270 feet from the right abutment and has rust-colored standing water. Flow of water in this area was not observed.

c. Appurtenant Structures

1. Spillway

Concrete on the spillway weir has eroded as shown by photograph 4. The capstones on the spillway training walls are loose, showing displacement, especially at the ends.

The spillway discharge channel is overgrown with brush downstream of the weir as shown in photograph 5. Where observable, the channel floor is lined with riprap. Bedrock is present in the channel floor near the right training wall.

2. Outlet Works

The brick and granite stone intake structure was observed to be in good condition. According to Water Department personnel, all gates at the gate structure are operable.

The downstream outlet structure masonry headwall was observed to be in good condition. The gates at the control chamber have not been operated in many years. They are kept in a position which diverts water directly to the outlet headwall. The aerator structure is basically abandoned and has not been in use in many years. See photographs 16 and 17.

The area from the downstream toe to the outlet structure headwall is heavily overgrown with brush and trees, as shown in the aerial photograph and photograph 8. The seepage noted at the intersection of the left abutment and downstream slope of the dam flows to the outlet structure and is eroding the soil behind the right side of the headwall.

d. Reservoir Area

There are no indications of instability along the banks of the reservoir in the vicinity of the dam.

e. Discharge Channel

Both the spillway and outlet discharge channels are heavily overgrown with brush.

3.2 Evaluation

Based on the visual inspection, the dam appears to be in generally fair condition. The inspection disclosed the following items which require attention:

a. The seepage at the intersection of the left abutment and downstream slope, if uncontrolled, could lead to internal erosion and instability of the dam.

b. The wet areas along the downstream toe of the right half of the dam are indicative of seepage which could result in internal erosion and instability of the dam.

c. The subsidence of the crest near the right spillway training wall may be indicative of erosion or piping of soil in these areas.

d. The roots of trees near the downstream toe of the dam could provide seepage paths leading to instability of the dam. If these trees are uprooted, they could result in local sloughing leading to instability of the dam.

e. Concrete on the spillway weir is eroded. Capstones on the spillway training walls are loose.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General

The dam is a water supply facility that serves primarily as a backup supply source. When the level of downstream, Farnham Reservour is low the outlets at Sandwash are opened, thus raising the level at Farnham. The spillway weir is ungated.

b. Description of Warning Systems

There are no warning systems at this dam.

4.2 Maintenance Procedures

a. General

The dam is maintained by the City of Pittsfield Water Department. Typical maintenance consists of mowing the side slopes and crest the dam.

b. Operating Facilities

There is no formal maintenance procedure for this structure. As the dam is used for water supply purposes, any operational deficiencies in the gate valves should be detected during normal operation.

4.3 Evaluation

There are no formal written operational or maintenance procedures. Brush and tree growth on the upstream and downstream

toe areas and the spillway and outlet channels should be removed. The spillway weir and training walls should be repaired. The Owner should institute a program of annual technical inspection and develop a formal warning plan for downstream areas in case of an emergency.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Sandwash Reservoir is located in the Town of Washington, about 2.7 miles southeast of the City of Pittsfield. The drainage area, 1.7 s.m. (1073 acres), is wooded, undeveloped land within the Pittsfield State Watershed area. The terrain is rolling and there is one brook which carries runoff to the reservoir.

The reservoir outlet, Roaring Brook, flows west about 4.5 miles to reach the Housatonic River, in the Town of Lenox.

5.2 Design Data

The dam was constructed in 1936. Design plans dated 1935 and 1936 were found at the City of Pittsfield, Engineering Department.

5.3 Experience Data

United States Weather Bureau records indicate that during the period of August 11 to 15 and again on August 17 to 20, 1955, about 4 to 6 inches of rainfall occured near the general location of the dam.

5.4 Test Flood Analysis

The dam has a size classification of intermediate and a significant hazard potential. Based upon Corps Guidelines, the

test flood would be in the range of 1/2 PMF to full PMF. For this analysis, the full PMF test flood was selected due to the dams size and hazard potential. The Corps Guideline for rainfall runoff from a "rolling" terrain area is 2000 cfs/sm. The test flood inflow from the 1.7 s.m. drainage area is 3,400 cfs. The routed outflow through the spillway would be 2610 cfs, 50± percent of the spillway's maximum capacity of 5,135 cfs.

Assuming the reservoir was initially filled to tne spillway level (photograph 4) elevation 1895.0, the inflow would surcharge the reservoir to elevation 1899.4. Water would be about 4.4 feet deep above the spillway, weir, which is 6 feet below the top of the dam, leaving a freeboard height of 1.6 feet. The spillway has no provisions for flashboards. The dam is not overtopped by the test flood.

5.5 Dam Failure Analysis

This dam was determined to have a significant hazard potential due to the potential for the loss of a few lives from an assumed dam failure. The dam was assumed to have failed when the water level was at elevation 1901.0, top of dam. The peak failure discharge of 47,720 cfs is developed by assuming a breach width on the left side of the dam of 270 feet for tne 41.0 foot high structure.

The outlet channel, Roaring Brook, runs westerly about 4.5 miles to reach the Housatonic River. Three impact areas were

determined in this analysis. They occur at Ashley Lake Road, Whitney Place Road and October Mountain Road which includes one residence.

At the first area, Ashley Lake Road, station 6+00, the road is overtopped by up to 6± feet of floodwater. Damage to vehicles could be incurred here. The flooded section would be confined to 150± feet of road.

At the second impact area, Whitney Place Road, station 113+00±. The road will be overtopped by up to 14± feet of floodwater. Damage would be confined to venicular traffic for a 200± feet reach of road.

The third impact area occurs at October Mountain Road, station 232+00. Here, the road could be overtopped by at least 2± feet of floodwater. There is one resident, 250 feet right of Roaring Brook station 232+00 that is likely to experience flooding of about 2 feet deep above first floor level in the event of a dam failure. Also, it is possible that the road would be washed out at this time from October Mountain Road to the Housatonic River (800± feet). The flood flow would fan out and discharge as surface flow to the river.

Just prior to dam failure, spillway discharge would be about 5,135 cfs. This flow will cause no apparent downstream flooding problems at road crossings or the residence at station 232+00.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The visual inspection indicates the following potential strucural problem:

a. The presence of seepage at locations near the downstream toe of the dam and near the left abutment, if left uncontrolled, could lead to failure of the dam.

b. Areas of erosion or seepage could be created by the uprooting or decaying of trees located on the downstream toe of the embankment.

6.2 Design and Construction Data

Design drawings prepared by the City of Pittsfield Department of Public Works dated November 1935 and additional drawings dated March through June 1936 were reviewed. The following geotechnical information was obtained from these drawings:

a. The upstream slope is 2 1/2H:1V above elevation 1881 and 3 1/4H:1V below elevation 1881. The downstream slope is 2H:1V with a 3 foot wide berm at elevation 1881.

b. The entire upstream slope is covered with riprap and is underlain by 18 inches of gravel. A reinforced concrete cutoff wall extends the full length of the dam and is founded in

a cutoff trench on bedrock. A rock toe is present at the downstream toe which is filtered by a 2 foot thick zone of gravel.

6.3 Post Construction Changes

No significant post construction changes to the dam are known.

6.4 Seismic Stability

The dam is located within Seismic Zone 2 and in accordance with the recommended Phase I guidelines does not require seismic stability analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

Based on a visual inspection and the available information, the dam is judged to be in fair condition.

b. Adequacy of Information

The information available, along with the visual inspection, is adequate for a Phase I level investigation.

c. Urgency

The recommendations and remedial measures presented in Sections 7.2 and 7.3 should be implemented within one year after receipt of this Phase I Inspection Report by the Owner.

7.2 Recommendations

The Owner should engage a qualified registered professional engineer to investigate and design required remedial measures for:

a. The source of seepage at the intersection of the slope and right abutment and at the downstream toe of the right half of the dam.

b. The crest subsidence near the right spillway training wall.

c. Means of removing trees and roots from the dam and selecting acceptable backfill for holes created by root removal.

The Owner should implement all the recommendations of the engineer.

7.3 Remedial Measures

a. Operating and Maintainence Procedures

1. Brush growth on the upstream slope and brush and trees on the downstream slope should be cut as part of routine annual maintenance.

2. Brush in the spillway and outlet discharge channels should be removed.

3. Brush and trees overgrowing at the outlet structure should be cleared and the erosion on the right side of the headwall repaired.

4. A path from the downstream toe to the outlet works should be cleared to provide access for inspection of these facilities.

5. The concrete on the crest of the spillway weir should be repaired.

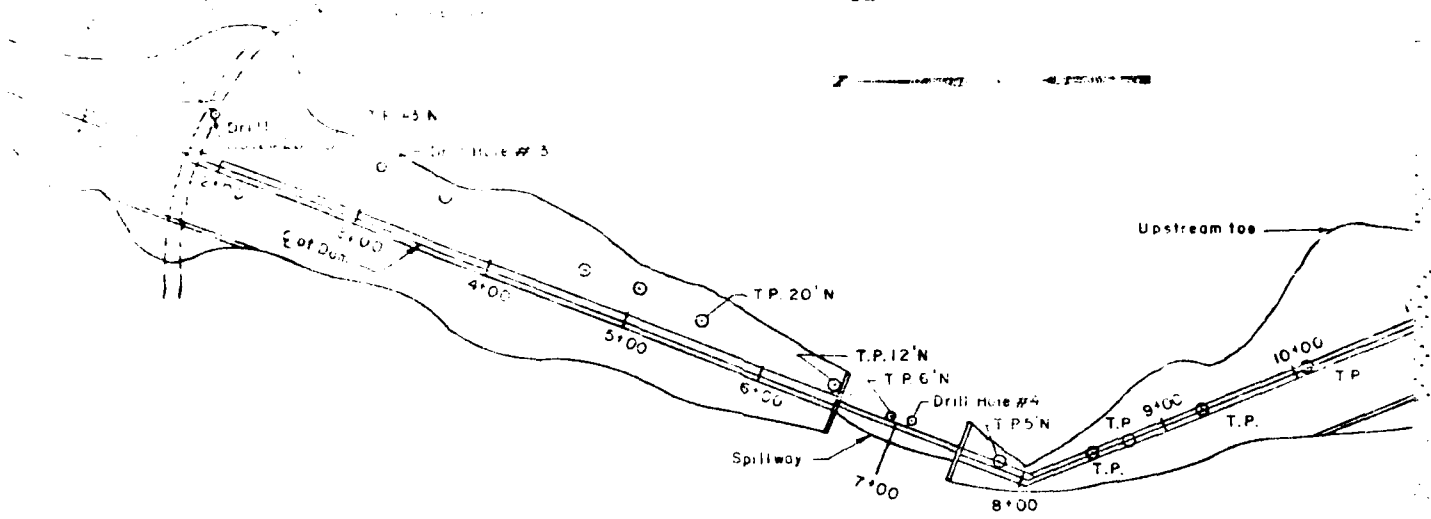
6. The capstones at the spillway training walls should be reset and the joints pointed.

7. The Owner should develop a formal warning system for downstream areas in case of emergency.

8. The Owner should institute a program of annual technical inspection.

7.4 Alternatives

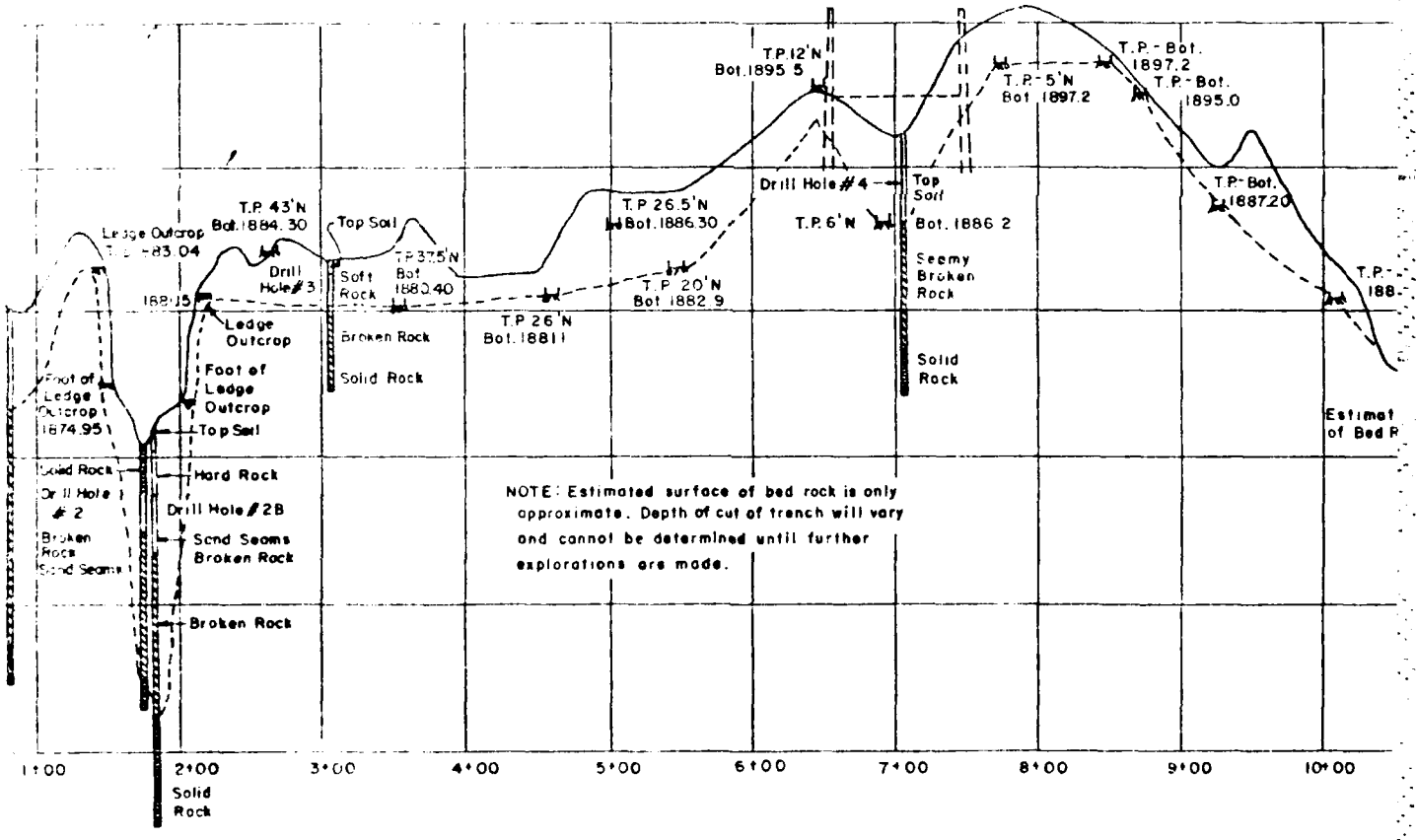
There are no practical alternatives for these recommendations and remedial measures.



PLAN OF DAM

SCALE

0 80 160 240

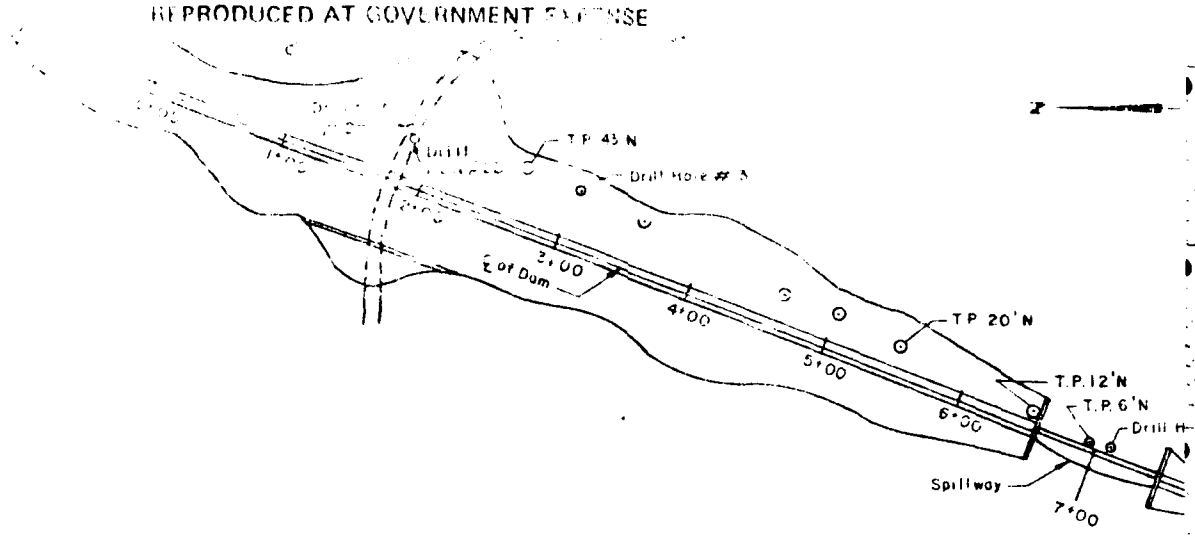


PROFILE NEAR CENTER LINE OF DAM

SCALE

0 80 160 240

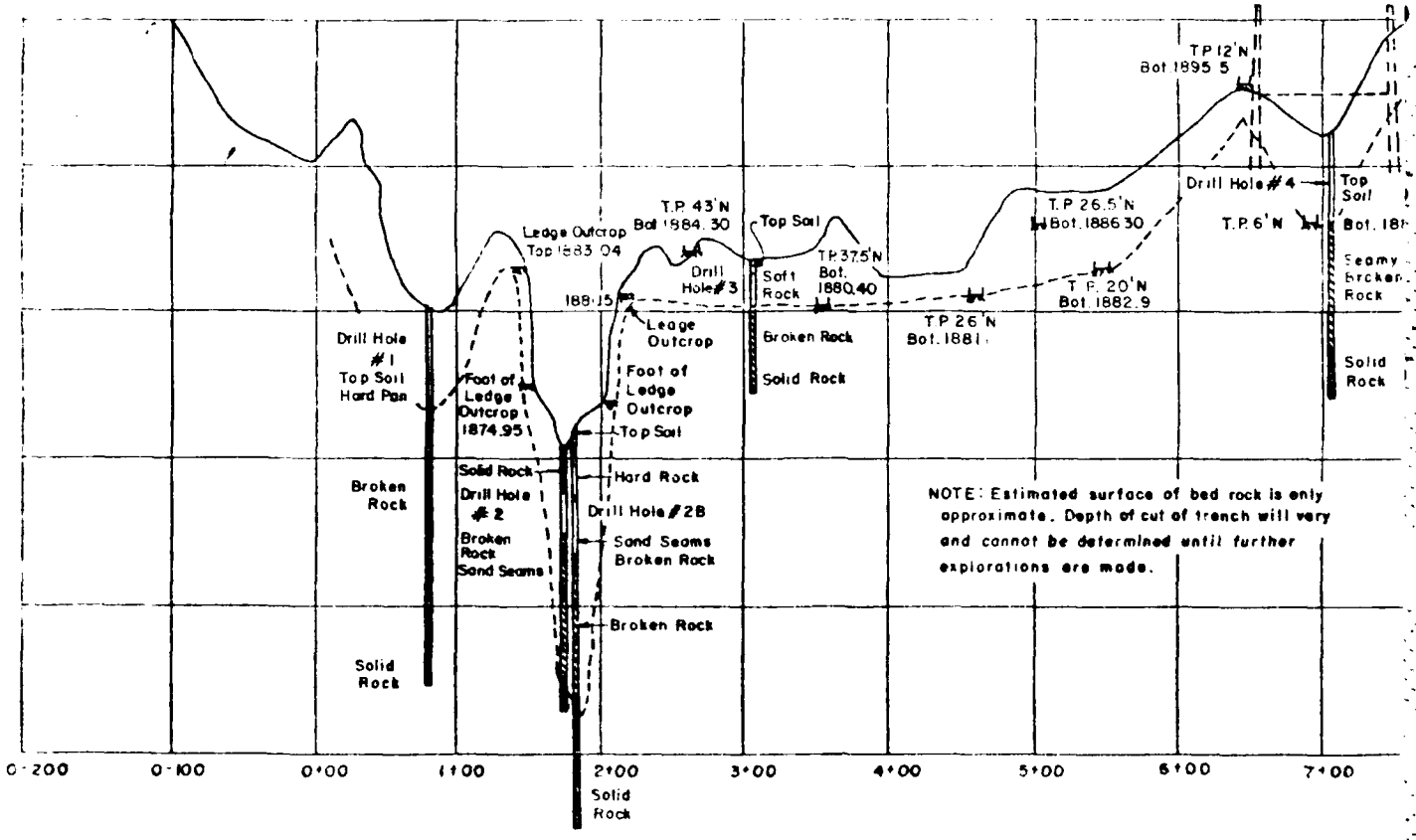
PLAN DATED NOVEMBER 1935



PLAN OF

SCALE

0 80



PROFILE NEAR CENTER L

SCALE

0 80 160

TAKEN FROM CITY OF PITTSFIELD DPW PLAN DATED NOVEMBER 1935

LIST OF AVAILABLE ENGINEERING DATA

1. Design plans dated November 1935, April 1936 and July 1936 were made availabe at the Pittsfield Engineering Department, City Hall, Allen Street, Pittsfield, Massachusetts 02101.

2. State Inspection Reports for the years 1971, 1972 and 1976 and a 1966 County Inspection Report were made available at the Department of Environmental Quality Engineering, Division of Waterways, 100 Nashua Street, Boston, Massachusetts 02114.

APPENDIX B

ENGINEERING DATA

PERIODIC INSPECTION CHECKLIST

PROJECT SANDWASH RESERVOIR DAM DATE 7/1/81

PROJECT FEATURE Outlet Works NAME K. Dalenberg, D. Vine

DISCIPLINE Geotechnical, Structural, Hydraulic NAME R. Cheney, M. Angieri

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	None at this project.
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Underside of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

PERIODIC INSPECTION CHECKLIST

PROJECT SANDWASH RESERVOIR DAM DATE 7/1/81

PROJECT FEATURE Outlet Works - Spillway NAME K. Dalenberg, D. Vine

DISCIPLINE Geotechnical, Structural, Hydraulic NAME R. Cheney, M. Angieri

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Below water.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	None.
Floor of Approach Channel	Below water.
b. Weir and Training Walls	
General Condition of Concrete	Fair
Rust or Staining	None observed
Spalling	Along crest of weir.
Any Visible Reinforcing	None observed
Any Seepage or Efflorescence	None observed
Drain Holes	None observed.
c. Discharge Channel	
General Condition	Fair.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	None.
Floor of Channel	Random riprap floor - some bedrock - overgrown with small brush.
Other Observations	Minor debris in channel.
Other Comments	Some capstones loose on training walls.

PERIODIC INSPECTION CHECKLIST

PROJECT SANDWASH RESERVOIR DAM DATE 7.1.81

PROJECT FEATURE Outlet Works NAME K. Dalenberg, D. Vine

DISCIPLINE Geotechnical, Structural, Hydraulic NAME R. Cheney, M. Angieri

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Small masonry headwall in good condition
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	None observed.
Channel	Short concrete section followed by overgrown channel.
Loose Rock or Trees Overhanging Channel	None observed.
Condition of Discharge Channel	Overgrown with brush.

PERIODIC INSPECTION CHECKLIST

PROJECT SANDWASH RESERVOIR DAM DATE [illegible]

PROJECT FEATURE Outlet Works NAME K. Dalenberg, D. Vine

DISCIPLINE Geotechnical, Structural, Hydraulic NAME R. Cheney, M. Angieri

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	None at this project.
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECKLIST

PROJECT SANDWASH RESERVOIR DAM DATE 7/1/81

PROJECT FEATURE Outlet Works NAME K. Dalenbert, D. Vine

DISCIPLINE Geotechnical, Structural, Hydraulic NAME R. Cheney, M. Angieri

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	None at this project.
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	All controls manual.
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECKLIST

PROJECT SANDWASH RESERVOIR DAM DATE 7/1/81

PROJECT FEATURE Dam Embankment NAME K. Dalenberg, D. Vine

DISCIPLINE Geotechnical, Structural, Hydraulic NAME R. Cheney, M. Angieri

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	
Slope Conditions	Below water.
Bottom Conditions	Below water.
Rock Slides or Falls	Below water.
Log Boom	" "
Debris	" "
Condition of Concrete Lining	" "
Drains or Weep Holes	Below water.
b. Intake Structure	
Condition of Concrete	Below water.
Stop Logs and Slots	Below water.

PERIODIC INSPECTION CHECKLIST

PROJECT SANDWASH RESERVOIR DAM DATE 7/1/81

PROJECT FEATURE Dam Embankment NAME K. Dalenberg, D. Vine

DISCIPLINE Geotechnical, Structural, Hydraulic NAME R. Cheney, M. Angieri

AREA EVALUATED	CONDITION
DAM EMBANKMENT (CON'T.)	
Toe Drains	Rock at toe observed in some areas.
Instrumentation System	None observed.
Vegetation	1) Heavy tree growth at intersection of downstream slope and left abutment. 2) Heavy growth along toe at right half of dam. 3) Heavy growth beyond toe between toe and outlet structure. 4) Minor brush on upstream slope.

PERIODIC INSPECTION CHECKLIST

PROJECT SANDWASH RESERVOIR DAM DATE [illegible] 81

PROJECT FEATURE Dam Embankment NAME K. Dalenberg, D. Vine

DISCIPLINE Geotechnical, Structural, Hydraulic NAME R. Cheney, M. Angieri

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	1901
Current Pool Elevation	1895
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed.
Pavement Condition	No pavement.
Movement or Settlement of Crest	Settlement of crest adjacent to right wall of spillway.
Lateral Movement	None observed.
Vertical Alignment	Good.
Horizontal Alignment	Good.
Condition at Abutment and at Concrete Structures	Settlement of crest (<1 ft) adjacent to right wall of spillway.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes	None observed.
Sloughing or Erosion of Slopes or Abutments	None observed.
Rock Slope Protection - Riprap Failures	Riprap in good condition - no failures observed - slight subsidence near right wall of spillway on upstream side.
Unusual Movement or Cracking at or Near Toe	None observed.
Unusual Embankment or Downstream Seepage	1) At intersection of slope and abutment about 145 ft south of gatehouse - [illegible] age of a few gpm was [illegible] flowing to outlet structure/ water [illegible]. 2) Wet areas along toe of right dam. Standing water about 1' [illegible] right abutment.
Piping or Boils	None observed.
Foundation Drainage Features	None observed.

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT SANDWASH RESERVOIR DAM

DATE 7/1/81

TIME 9 a.m.

WEATHER Partly sunny - 80°

W.S. ELEV. 1895 U.S. ____ DN.S.

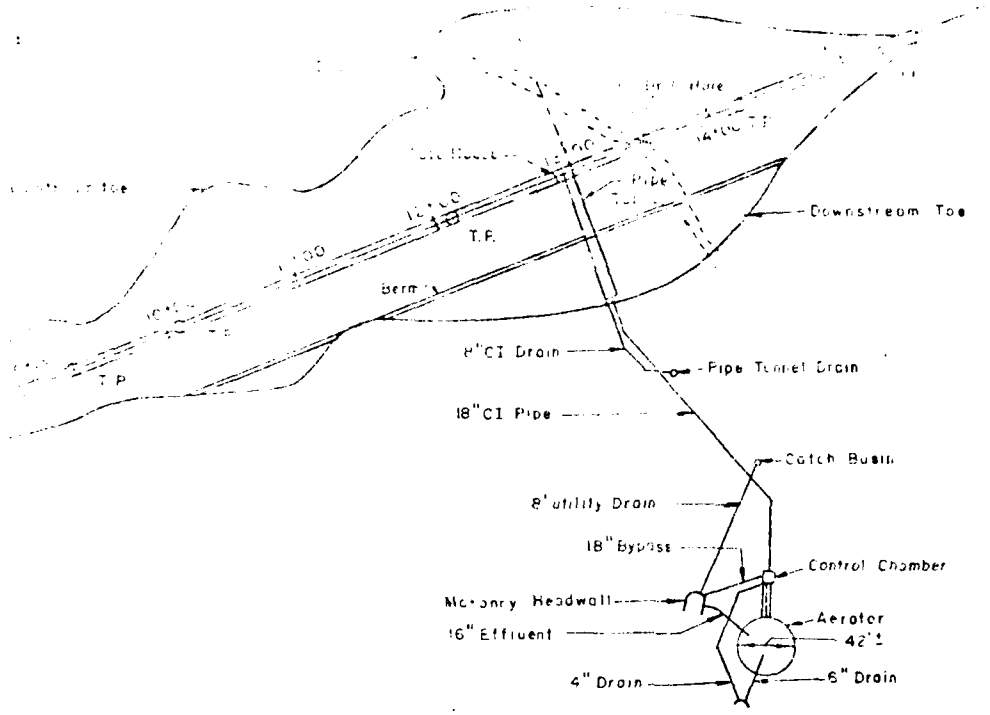
PARTY:

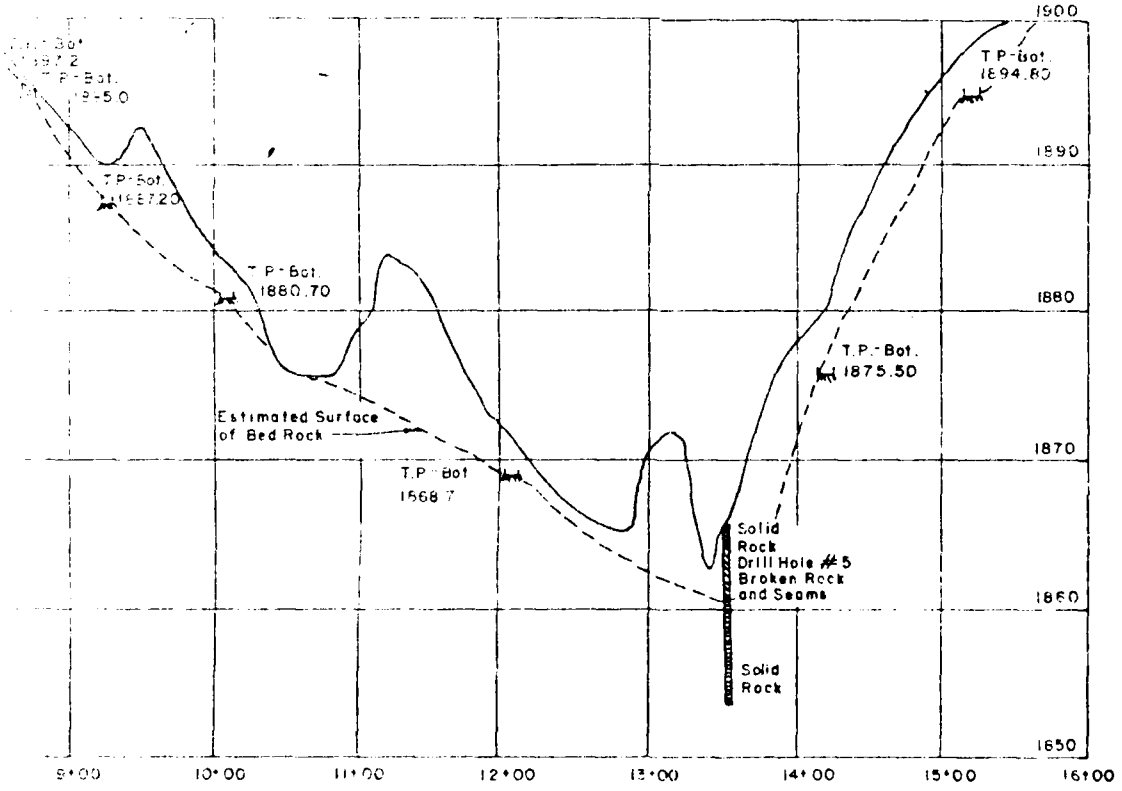
1. Ron Cheney - HHB
2. Dave Vine - HHB
3. Mike Angieri - HHB
4. Karl Dalenberg - GEI
5. Ray Pulver - Pittsfield Water Dept
6. ____
7. ____
8. ____
9. ____
10. ____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Dam Embankment	R.C., D.V., M.A., K.D.	
2.	Outlet Works	R.C., D.V., M.A., K.D.	
3.	Spillway	R.C., D.V., M.A., K.D.	
4.			
5.			
6.			
7.			
8.			
9.			
10.			

APPENDIX A

INSPECTION CHECKLIST





HAYDEN, HARDING & BUCHANAN, INC CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

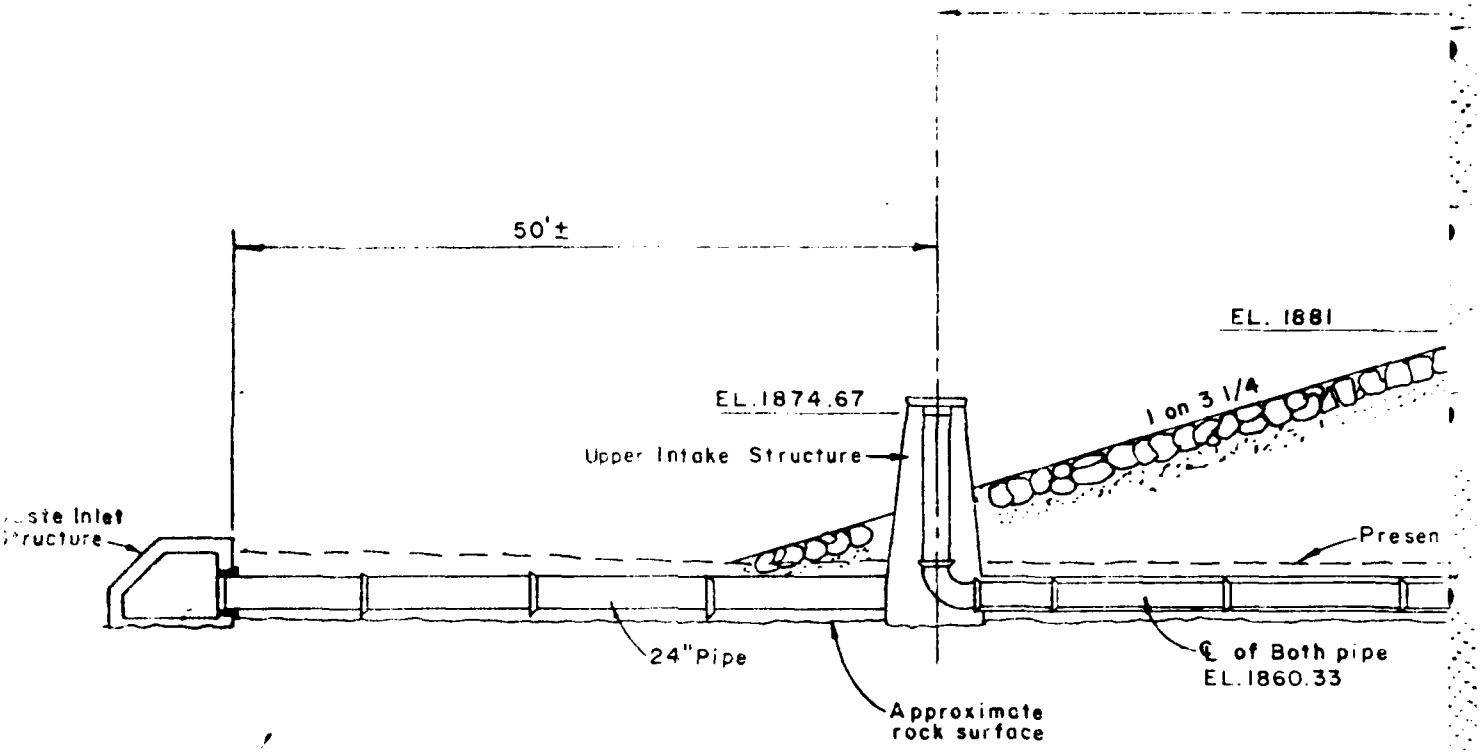
DAM 3

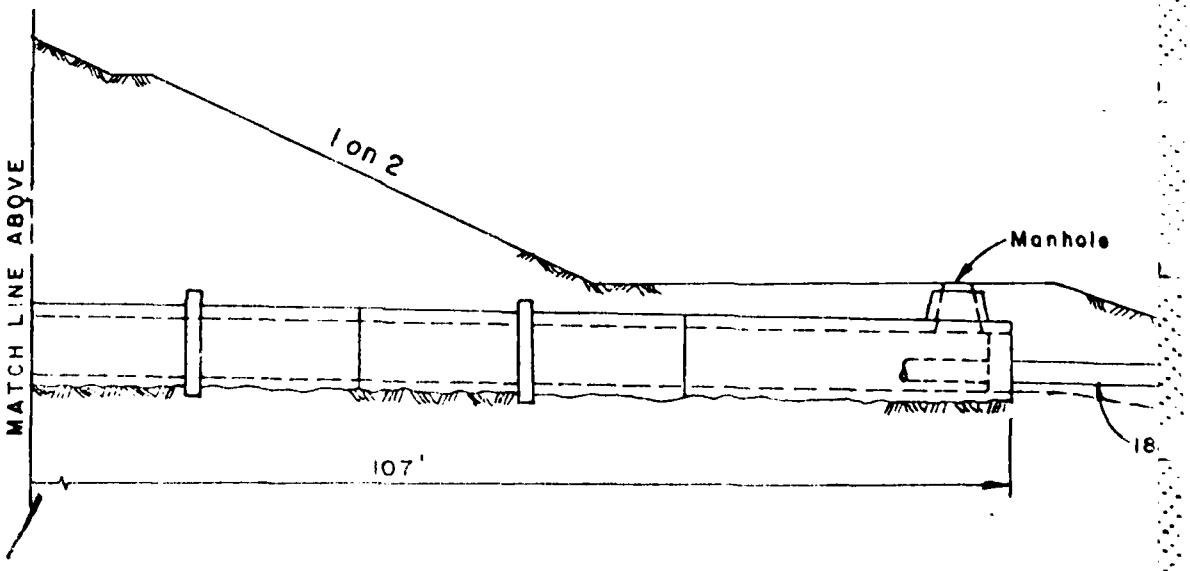
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

SANDWASH DAM
PLAN & PROFILE

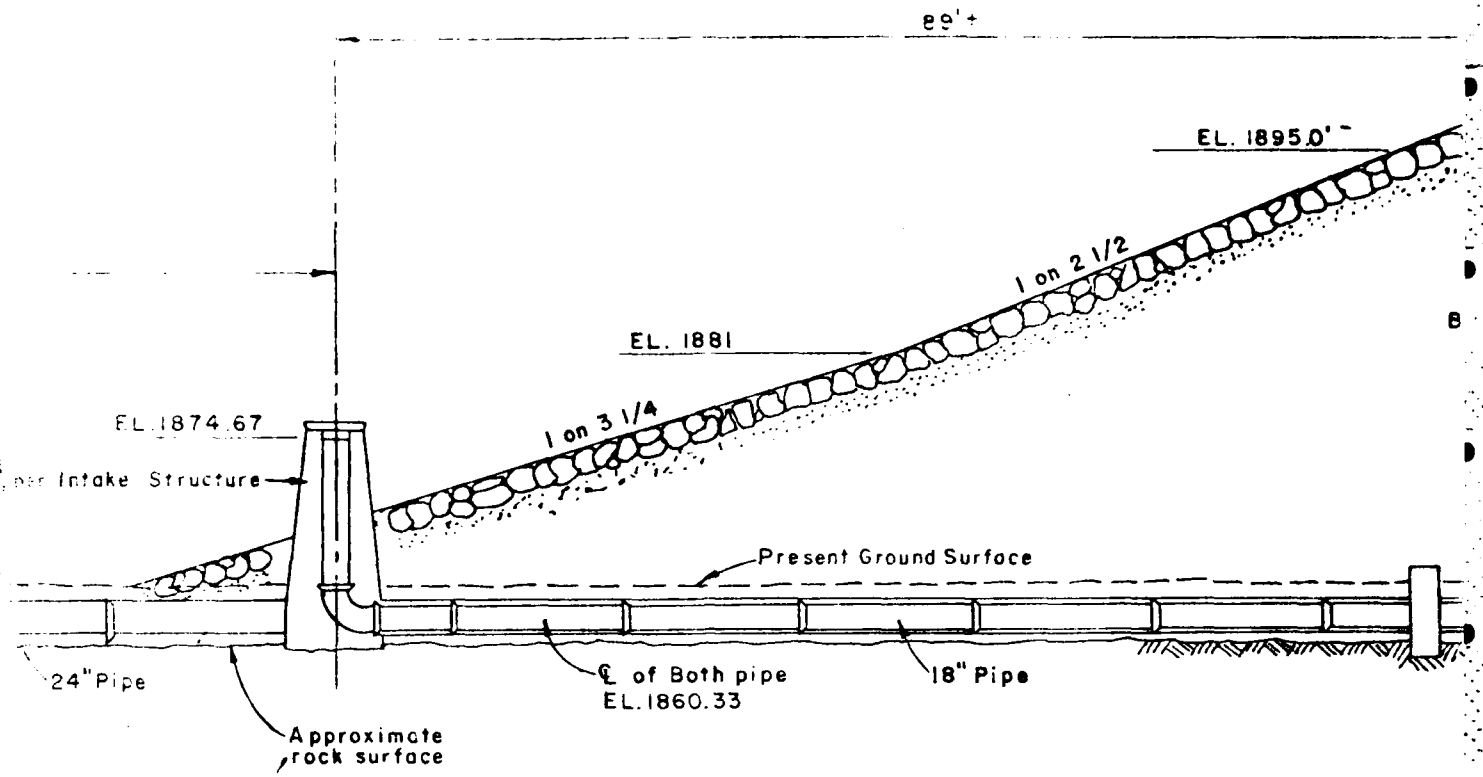
WASHINGTON MASSACHUSETTS

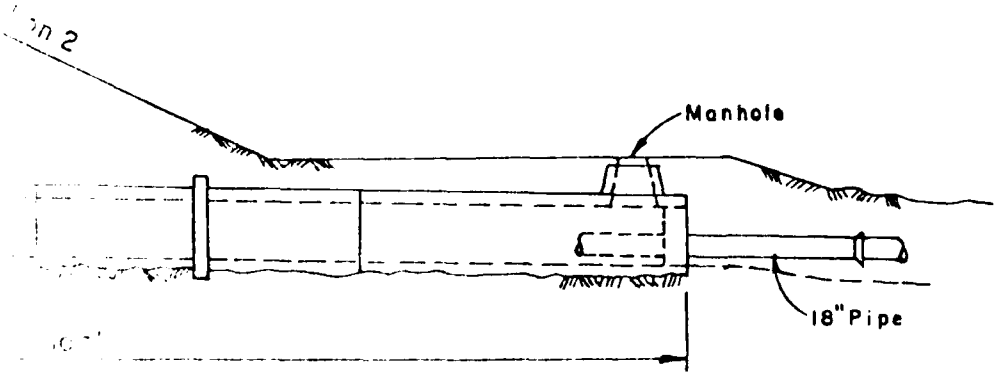
			SCALE AS SHOWN
			DATE AUGUST 1981





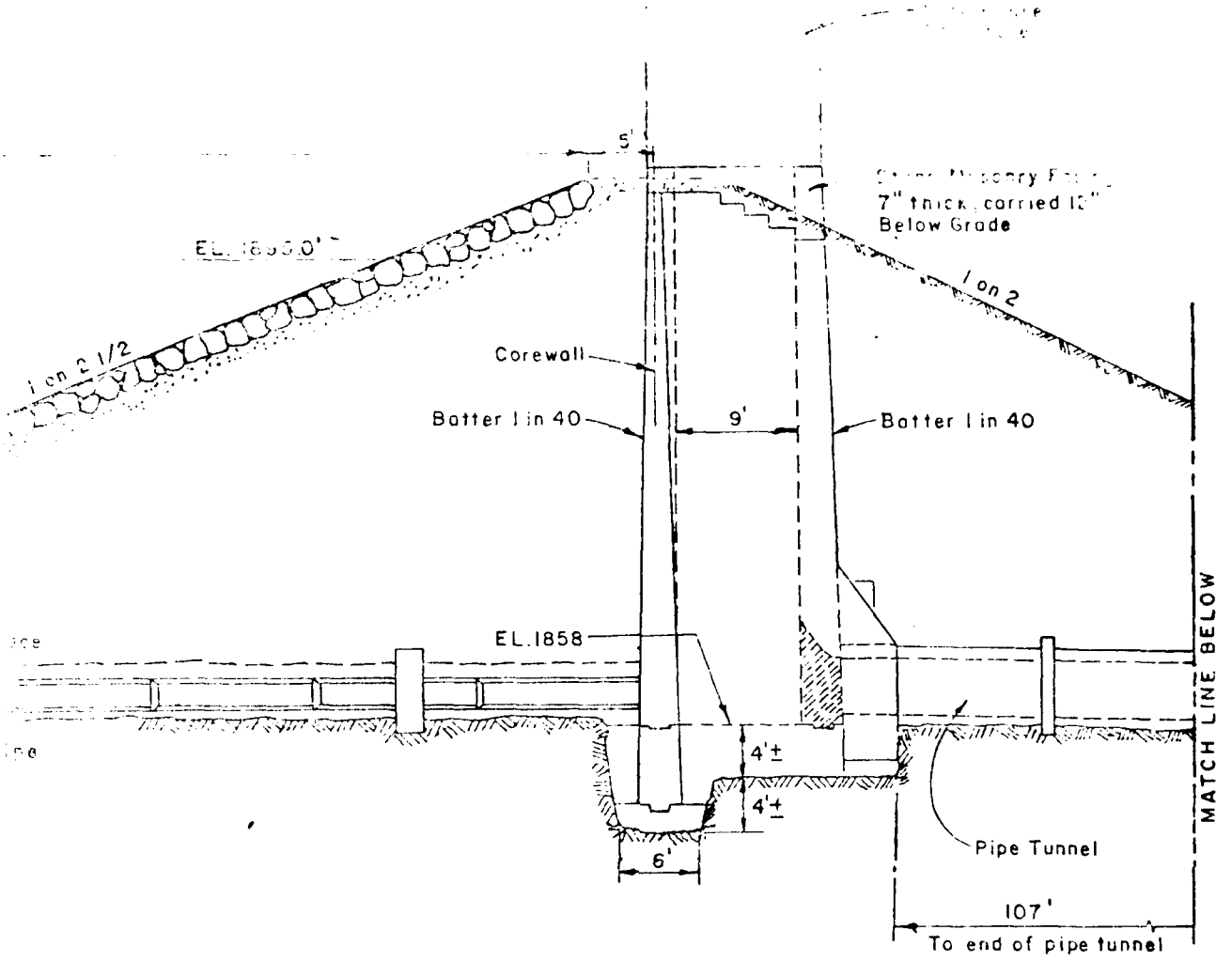
TAKEN FROM CITY OF PITTSFIELD, DEPT. OF PUBLIC WORKS PLANS DATED APRIL 1936





2

WORKS PLANS DATED APRIL 1936



HAYDEN, HARDING & BUCHANAN, INC CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

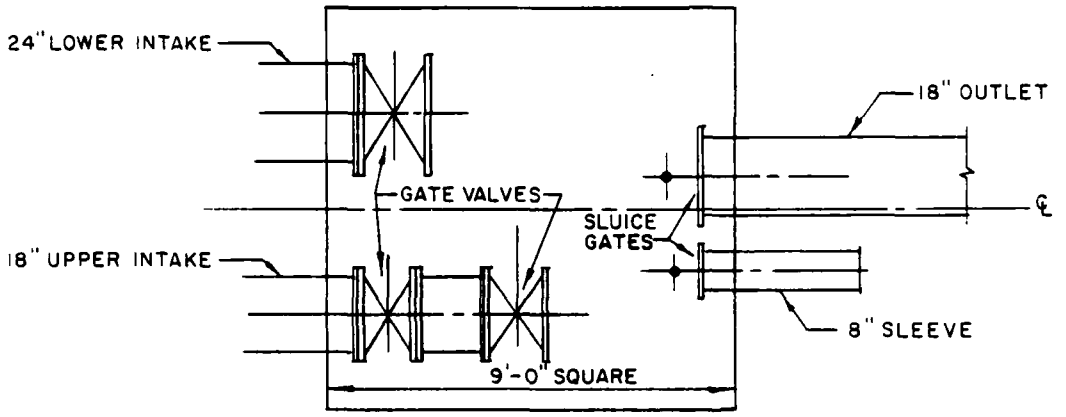
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

SANDWASH DAM
SECTION AT GATE HOUSE

WASHINGTON MASSACHUSETTS

SCALE NOT TO SCALE
DATE AUGUST, 1981

3



SECTION AT BOTTOM OF GATEHOUSE WELL

SCALE
1/4" = 1'-0"

HAYDEN, HARDING & BUCHANAN, INC. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

SANDWASH DAM

SECTION AT BOTTOM OF GATEHOUSE WELL

WASHINGTON MASSACHUSETTS

			SCALE: AS SHOWN
			DATE: AUGUST, 1981

TAKEN FROM CITY OF PITTSFIELD DPW PLAN DATED APRIL 1935

The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.
DIVISION OF WATERWAYS

100 Nashua Street, Boston 02114

October 19, 1976

City of Pittsfield
City Hall
Pittsfield, Massachusetts
ATT: Mr. Lewis Newbill

RE: Inspection Dam #1-2-313-9
Washington
Sandwash Dam

Gentlemen:

On November 4, 1975 , an Engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate the owner to be the City of Pittsfield. If this information is incorrect will you please notify this office.

The inspection was made in accordance with the provisions of Chapter 253 of the Massachusetts General Laws as amended (Dams-Safety Act). Chapter 706 of the Acts of 1975 transferred the jurisdiction of the so-called "Dams Safety Program" to the Commissioner of the Department of Environmental Quality Engineering.

The results of the inspection indicate that this dam is safe; however the following conditions were noted that require attention:

Brush should be removed from downstream slope.

Minor repairs necessary on concrete and stone masonry spillway.

Several areas in the stone side walls need repointing.

Some seepage noted along the toe.

We call these conditions to your attention before they become serious and more expensive to correct. With any correspondence please include the number of the Dam as indicated above.

Very truly yours,

JOHN J. HANNON, P.E.
CHIEF ENGINEER

A.MC:ml

L-168

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: City/Town Washington. Dam No. 1-2-313-9.

Name of Dam Sandwash. Inspected by: Jordan.

Date of Inspection 11-4-75.

2. Prev. Inspection x.

Owner/s: per: Assessors_____.

Reg. of Deeds_____. Pers. Contact_____.

1. City of Pittsfield | City Hall | Pittsfield | Mass | 499-1100
   Name | St. & No. | City/Town | State | Tel. No.

2. _____
   Name | St. & No. | City/Town | State | Tel. No.

3. _____
   Name | St. & No. | City/Town | State | Tel. No.

3. Caretaker [if any] e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Lewis Newbill | City Hall | Pittsfield | | 499-1100
Name | St. & No. | City/Town | State | Tel. No.

4. No. of Pictures taken 5.

5. Degree of Hazard: [if dam should fail completely]*

1. Minor_____. 2. Moderate x.

3. Severe_____. 4. Disastrous_____.

*This rating may change as land use changes [future development]

6. Outlet Control: Automatic_____. Manual x.

Operative x yes: _____no.

Comments: _____

_____

Upstream face of Dam: Condition:

1. Good x. 2. Minor Repairs_____

3. Major Repairs_____. 4. Urgent Repairs_____

Comments: _____

_____

8. Downstream Face of Dam: Condition: 1. Good____. 2. Minor Repairs__x__.
3. Major Repairs___ 4. Urgent Repairs___.

Comments:_____

_____

9. Emergency Spillway: Condition: 1. Good_____. 2. Minor Repairs___x___.
3. Major Repairs_____. 4. Urgent Repairs_____.

Comments:_____

_____

_____

10. Water level @ time of inspection: ___2___. ft. above_____. below___x___.
top of dam_____.
principal spillway___x___.
other_____.

11. Summary of Deficiencies Noted:

Growth [Trees and Brush] on Embankment_____x_____.

Animal Burrows and Wasnouts_____.

Damage to slopes or top of dam_____.

Cracked or Damaged Masonry_____x_____.

Evidence of Seepage_____x_____.

Evidence of Piping_____.

Erosion_____.

Leaks_____.

Trash and/or debris impeding flow_____.

Clogged or blocked spillway_____.

Other_____.

12. Remarks & Recommendations: [Fully Explain]

Prev. insp. date 9-28-75

In general the dam is in good shape. The embankments have a good turf cover, are well mowed and no signs of sloughing or settlement was noted. The rip rapped upstream face is in good condition. The rock is well keyed and no undermining or settlement was found.

The city should be advised to remove the brush growth at the toe of the downstream slope to provide for easier inspection and mowing. Some seepage was noted along the toe, it appears to be normal.

Minor repairs are needed on the concreteand stone masonry spillway. Spalling has occured on the creast that should be refinished and sealed to prevent further damage. Several areas in the stone sidewalls are in need of repointing.

Except for the minor deficiencies noted, the dam appears to be safe.

For location see topo sheet no. 5C

---

13. Overall Condition:

1. Safe_____X_____.
2. Minor repairs needed_____X_____
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists [explain]

   Recommend removal from inspection list_____.

FILE
1-2-313-9

January 14, 1972

Mr. Lewis Newbill, Water Engineer
Water Department
City Hall
Pittsfield, Massachusetts

Inspection of Dam
Re: Washington-Sandwash Reservoir Dam

Dear Mr. Newbill:

The Massachusetts Department of Public Works inspected Sandwash Reservoir Dam in the Town of Washington, of which the City of Pittsfield is the supposed owner.

The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970.

The results of the inspection indicated that no immediate maintenance or repairs were required; however, the following items were noted that will require your attention in the future:

1. Repair cracks in spillway.
2. Remove growth and brush along toe of embankment.

We are calling these items to your attention now before they become more serious and expensive to correct.

Very truly yours,

F. C. Schwelm

FRED. C. SCHWELM, P.E.
Deputy Chief Engineer

LRA/emm

cc: Dean P. Amidon, D.H.E. #1

L-108

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: City/Town WASHINGTON. Dam No. 1-2-313-9.

Name of Dam Sandwash. Inspected by: R D Jordan.

Date of Inspection 9-28-72.

2. Prev. Inspection X.

Owner/s: per: Assessors_____.

Reg. of Deeds_____. Pers. Contact_____.

1. City of Pittsfield | City Hall | Pittsfield, MA | 499-1100
   Name | St. & No. | City/Town | State | Tel. No.

2. _____
   Name | St. & No. | City/Town | State | Tel. No.

3. _____
   Name | St. & No. | City/Town | State | Tel. No.

3. Caretaker [if any] e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Louis Newbill | City Hall | Pittsfield, MA | 499-1100
Name | St. & No. | City/Town | State | Tel. No.

4. No. of Pictures taken 3.

5. Degree of Hazard: [if dam should fail completely]*

1. Minor_____. 2. Moderate see report.

3. Severe_____. 4. Disastrous_____.

*This rating may change as land use changes [future development]

6. Outlet Control: Automatic_____. Manual X.

Operative X yes:_____no.

Comments:_____

_____

7. Upstream Face of Dam: Condition:

1. Good X. 2. Minor Repairs_____.

3. Major Repairs_____. 4. Urgent Repairs_____.

Comments:_____

_____

8. Downstream Face of Dam: Concition: 1. Good X. 2. Minor Repairs___.
3. Major Repairs___ 4. Urgent Repairs___.

Comments: _____

_____.

9. Emergency Spillway: Condition: 1. Good_____. 2. Minor Repairs_____.
3. Major Repairs_____. 4. Urgent Repairs_____.

Comments: _____

_____

_____

10. Water level @ time of inspection: 3' ft. above_____. below X.
top of dam_____.
principal spillway X.
other_____.

11. Summary of Deficiencies Noted:

Growth [Trees and Brush] on Embankment_____.

Animal Burrows and Washouts_____.

Damage to slopes or top of dam_____.

Cracked or Damaged Masonry X_____.

Evidence of Seepage_____.

Evidence of Piping_____.

Erosion_____.

Leaks_____.

Trash and/or debris impeding flow_____.

Clogged or blocked spillway_____.

Other_____.

12. Remarks & Recommendations: [Fully Explain]

Mr. Louis Newbill, J. Pierce and A. Gerlach from Pittsfield Water Department present during inspection.

The dam appears to be in good condition, there is no signs of sloughing or settlement in the embankment. The embankment is clear of brush and well mowed.

The concrete spillway is in good shape with the exception of minor spalling. At the time of this inspection the water was three feet below the spillway.

If the dam failed, the water would travel approximately 3½ miles before it would endanger life and property. Flooding would occur along the Housatonic River in Lenox and Lee.

13. Overall Condition:

1. Safe ___X___.
2. Minor repairs needed ___X___
3. Conditionally safe - major repairs needed _____.
4. Unsafe _____.
5. Reservoir impoundment no longer exists [explain]

   Recommend removal from inspection list _____.

169

DESCRIPTION OF DAM

DISTRICT ONE.

Submitted by R D Jordan Dam No. 1-2-313-9

Date 9-23-76. City/Town WASHINGTON

Name of Dam Sandwash

Location: Topo Sheet No. 5C.

Provide 8-1/2" x 11" in clear copy of topo map with location of Dam clearly indicated.

Year built: 1936. Year/s of subsequent repairs 1956

Purpose of Dam: Water Supply X. Recreational ____.

Irrigation ____. Other ____.

Drainage Area: 1.8 sq. mi. ____ acres.

Normal Ponding Area: ____ Acres; Avg. Depth ____.

Impoundment: 248M gals; ____ acre ft.

No. and type of dwellings located adjacent to pond or reservoir ____

i.e. summer homes etc. - - -

Dimensions of Dam: Length 1400'. Max. Height ____.

Slopes: Upstream Face 3/1 earth stone faced.

Downstream Face 3/1 earth.

Width across top 12.

Classification of Dam by Material:

Earth X. Conc. Masonry ____. Stone Masonry ____.

Timber ____. Rockfill ____. Other ____.

A. Description of present land usage downstream of dam: 100 %rural; ____ % urban.

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure
Yes X. No ____.

PHOTO NO.11 - General view of tree and brush growth near toe of right half of dam from right abutment.

PHOTO NO.12 - Area of subsidence of crest behind right wall of spillway below ruler in photo.

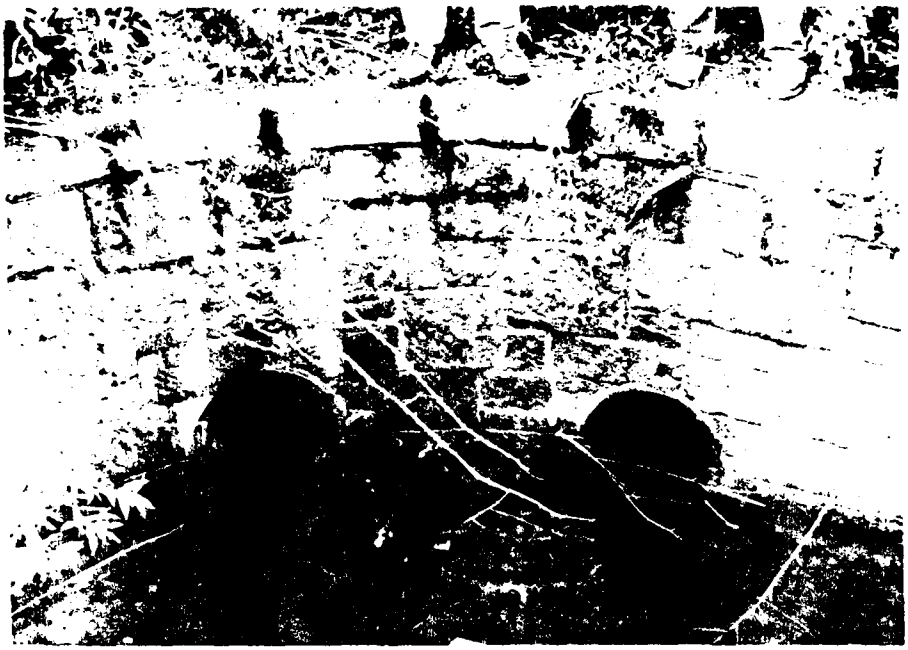


PHOTO NO.9 - View of 18 inch and 16 inch outlet pipes and headwall structure located about 200 feet below toe of dam.

PHOTO NO.10 - Crest of left half of dam.

PHOTO NO.7 - Downstream face of right half of dam.

PHOTO NO.8 - Flows of outlet structure located about 200 feet below toe of dam.

PHOTO NO.5 - General view of spillway discharge channel.

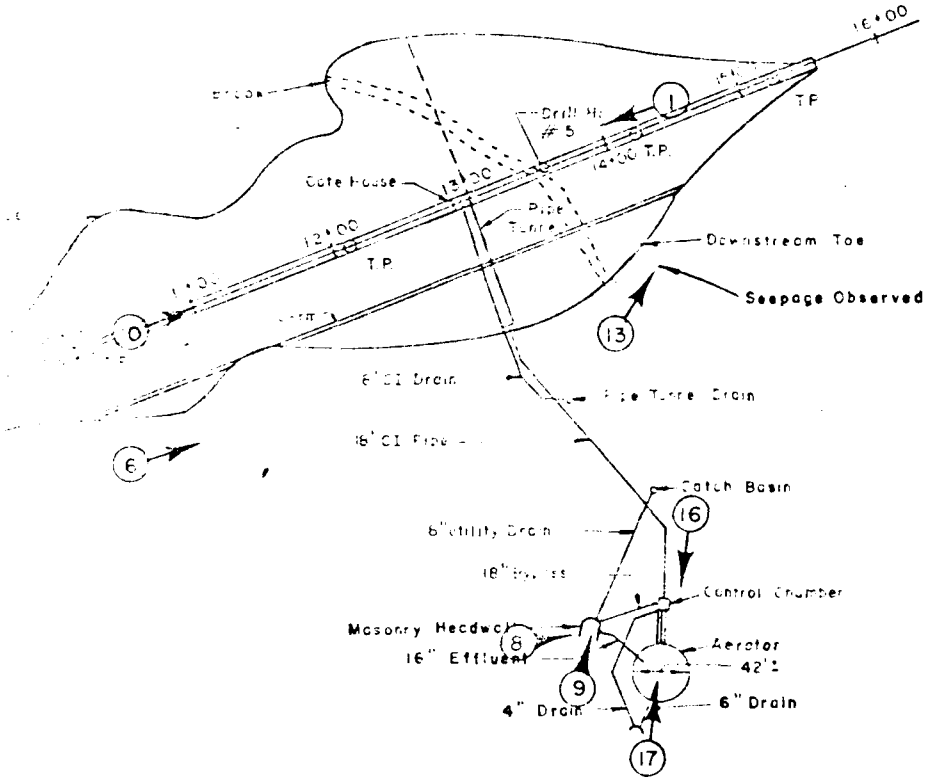
PHOTO NO.6 - General area of downstream face of left half of dam.

PHOTO NO.3 - View of upstream face of right half of dam embankment. View of gate-house structure in left background portion of photo.

PHOTO NO.4 - View of spillway weir and training wall taken from left side of spillway.

PHOTO NO.1 - View of gatehouse structure and upstream side slope of left half of dam embankment.

PHOTO NO.2 - View of reservoir taken from left spillway training wall.



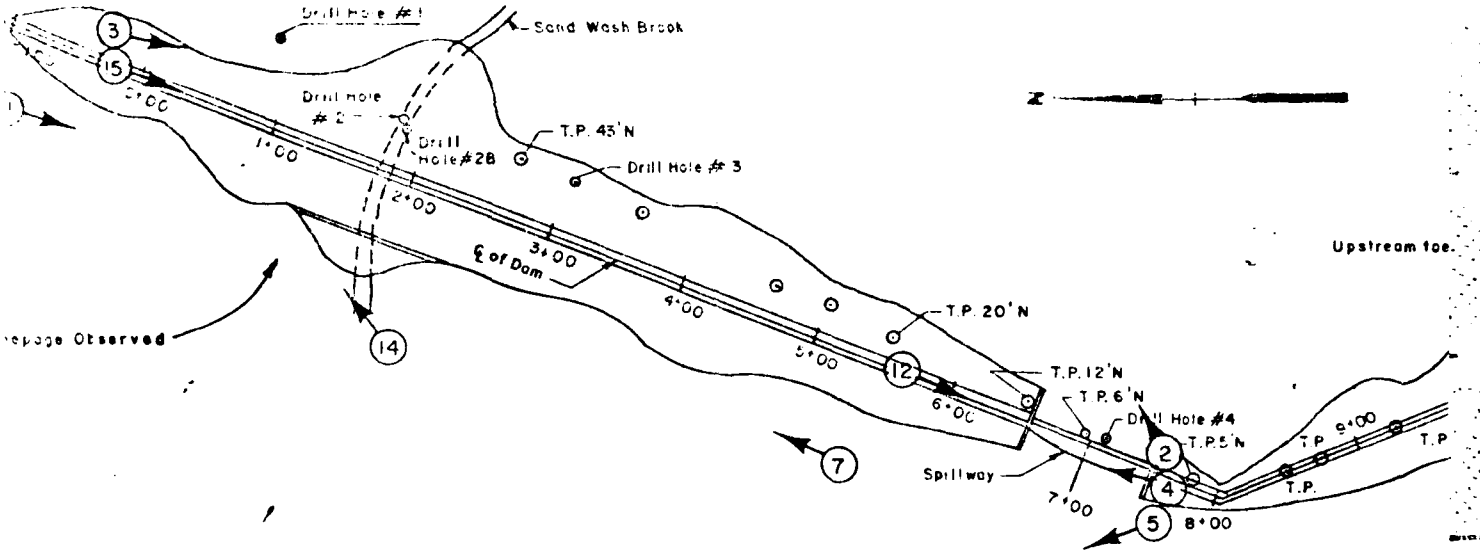
HAYDEN, HARDING & BUCHANAN, INC CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

SANDWASH DAM
PHOTO LOCATIONS

WASHINGTON MASSACHUSETTS

			SCALE: AS SHOWN
			DATE AUGUST, 1981



PLAN OF DAM

SCALE

0 80 160 240

APPENDIX C

PHOTOGRAPHS

COUNTY OF BERKSHIRE, MASS.

INSPECTION OF DAMS

City or Town of Washington Date 12 August 1966

Name of Dam Sand & Wash Res. Inspector Louis J. Diamond

Owner City of Pittsfield Address 33 Pearl St. Tel.

Caretaker George Pleau Address 147 Longview Terr. Tel. 2-7375

Location East side Ashley Lake Rd. one mi. north of Lenox Whitney Pl. Rd.

Type and Dimensions Earth fill-1000' long

Spillway, type and size 90' long -6' wide.

Outlets, type and size 18" C.I. pipe and gate.

Flashboards, type and height None

Date Built 1936 Condition Good

When last repaired 1956 By whose orders Owners

Nature of Repairs Masonry was pointed up.

Purpose of Dam Water supply-Pittsfield

Approximate storage of water 248 M.G.

Approximate area of water shed 1.8 sq. mi.

Possible damage due to failure of dam Could wash out roads-Possibly Fernum & Millbrook

Remarks Same repairs as noted in last report 1964.

Recommendations

INSPECTION OF DAMS Dam 28-10

City or Town of Washington Date June 25, 1971

Name of Dam Sandwash Reservoir Inspector R. Northrup P. Fezzie WATER ENGR, WATER Department

Owner City of Pittsfield Address City - Hall - Pittsfield, MA

Caretaker City of Pittsfield Address City Hall - Pittsfield, MA

Location east of Ashley Lake Rd. - 1 mile north of Lenox-Whitney Road

Type of Dimensions earth fill - 1000' long - 40'-50' high - riprap upstream

Spillway, type and size concrete - 90' long

Outlets, type and size 18" CI pipe and gate

Flashboards, type and height none

Date Built 1936 Condition good

When last repaired 1956 By whose orders owners

Nature of Repairs masonry pointed up

Purpose of Dam water supply - Pittsfield

Approximate storage of water 248 MG

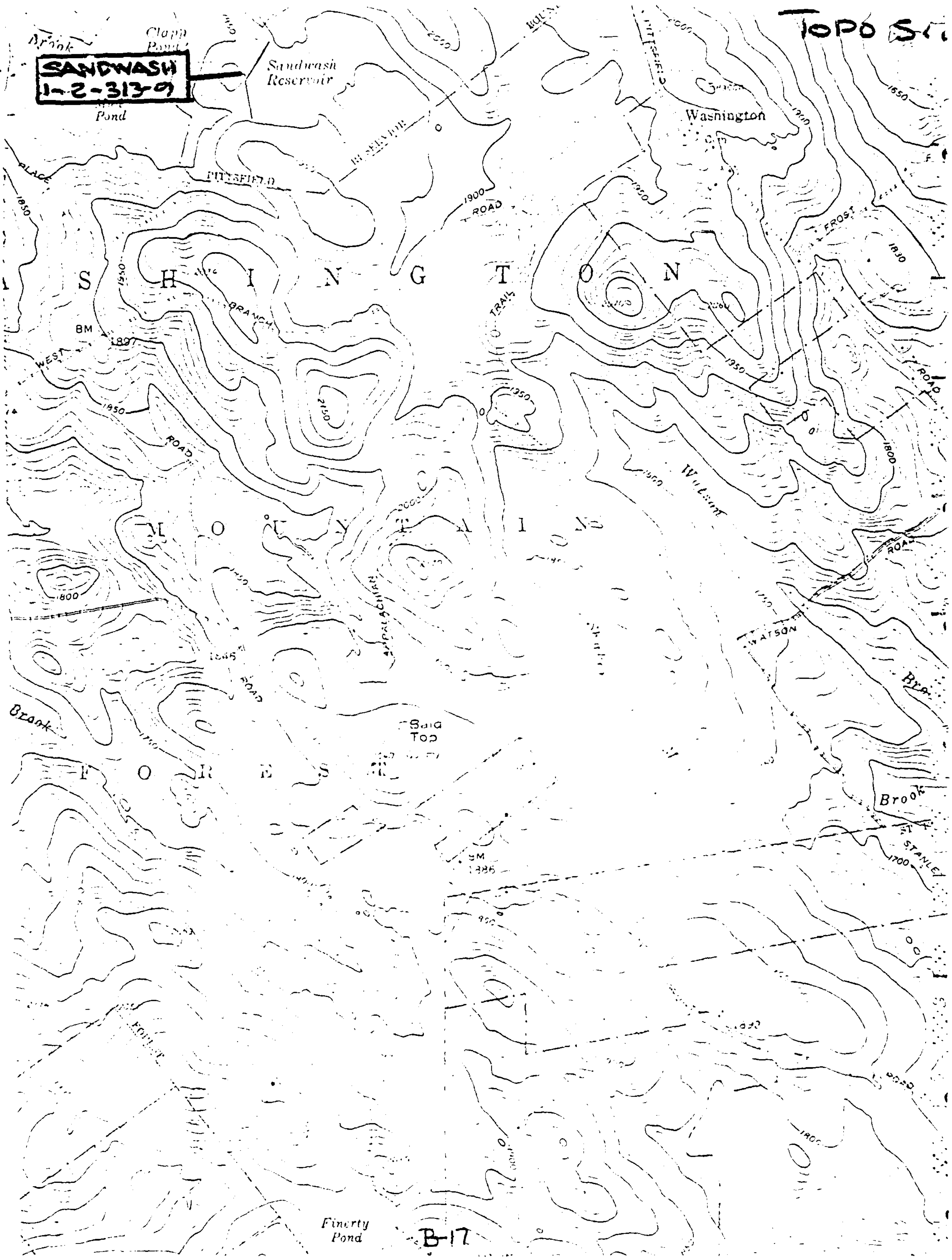
Approximate area of water shed 1.8 square miles

Possible damage due to failure of dam disasterous

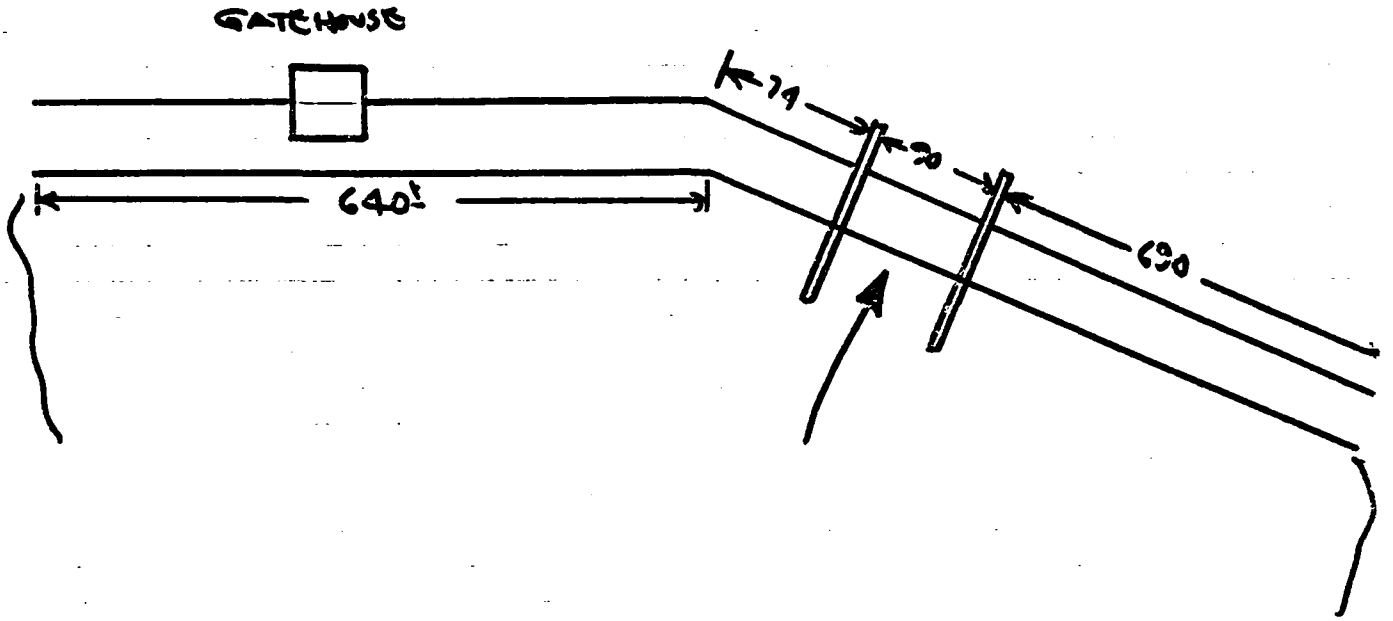
Remarks water 3" below spillway - small cracks in spillway - growth and brush along toe of embankment

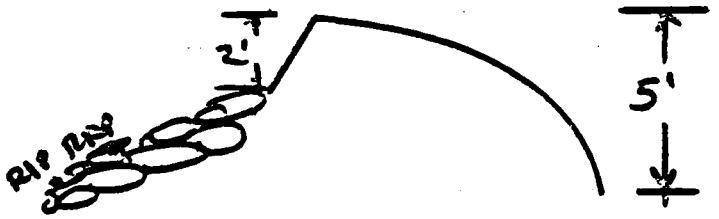
Recommendations repair cracks in spillway and clear brush

TOPO S

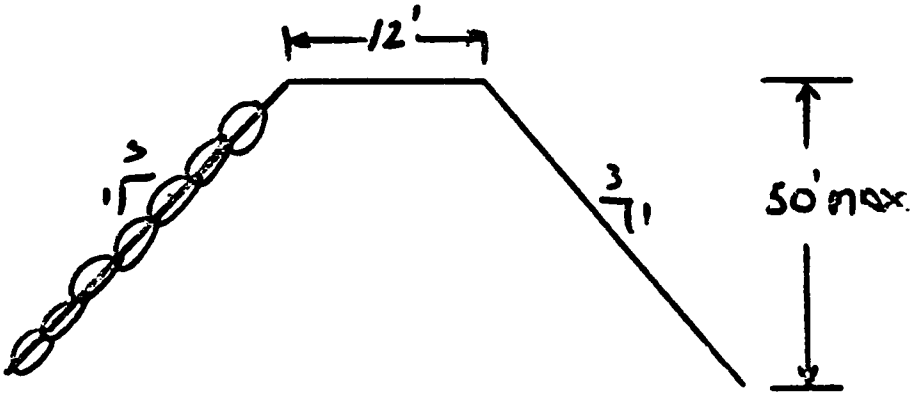

SANDWASH
1-2-313-9
Clapp Pond
Sandwash Reservoir
Pond
Washington
PITTSFIELD
ROAD
RESERVOIR
W A S H I N G T O N
M O U N T A I N
F O R E S T
BM 1897
WEST BRANCH
ROAD
TRAIL
APPALACHIAN
FROST
WATSON
Bald Top
BM 1886
Brook
STANLEY
Finerty Pond
1850
1900
1950
2000
2150
1800
1830
1700
1650

SANDWASH RES.
1-2-313-9





SPILLWAY SECT.



DAM SECT.

FREE BOARD = 5'

L-169 A

DAM NO. 1-2-313-9.

10.

Risk to life and property in event of complete failure.

No. of people unknown.

No. of Homes " .

No. of Businesses " .

No. of Industries " . Type .

No. of Utilities " . Type .

Railroads " .

Other dams " .

Other .

11.

Attach Sketch of dam to this form showing section and plan on 8-1/2" x 11" sheet.

PHOTO NO.13 - Seepage at downstream toe near intersection with left abutment about 145 feet south of the outlet structure.

PHOTO NO.14 - Standing water below toe of dam about 270 feet south of right side of dam.

PHOTO NO.15 - General view of crest of right half of dam.

PHOTO NO. 16 - View of Shed Housing the Control Chamber.

PHOTO NO. 17 - View of Aerator Structure.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

JOB NO. [illegible]
DATE [illegible]
BY [illegible]
CHK'D BY MX

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. E-2
JOB [illegible]
SUBJECT [illegible]
CLIENT [illegible]

Dam built in 1936

Hydraulic Height = 46ft ±
Storage Capacity = 1390. a-f ±
Size Class - Intermediate (1390 a-f)

Hazard Potential - Significant

Test Flood - Ranges from 1/2 to Full PMF
USE PMF = 2000 cfs/sm

Drainage Area - 1073 Acres (1.7 sq.mi.)

Test Flood Inflow - 1.7 sq.mi. x 2000 cfs/sm = 3+00 cfs equal full PMF

Test Flood Outflow -

Routed outflow = 2611 cfs at elev. 1899.5, top of dam is at elev. 1901.

Spillway capacity is 5133 cfs at elev. 1901.

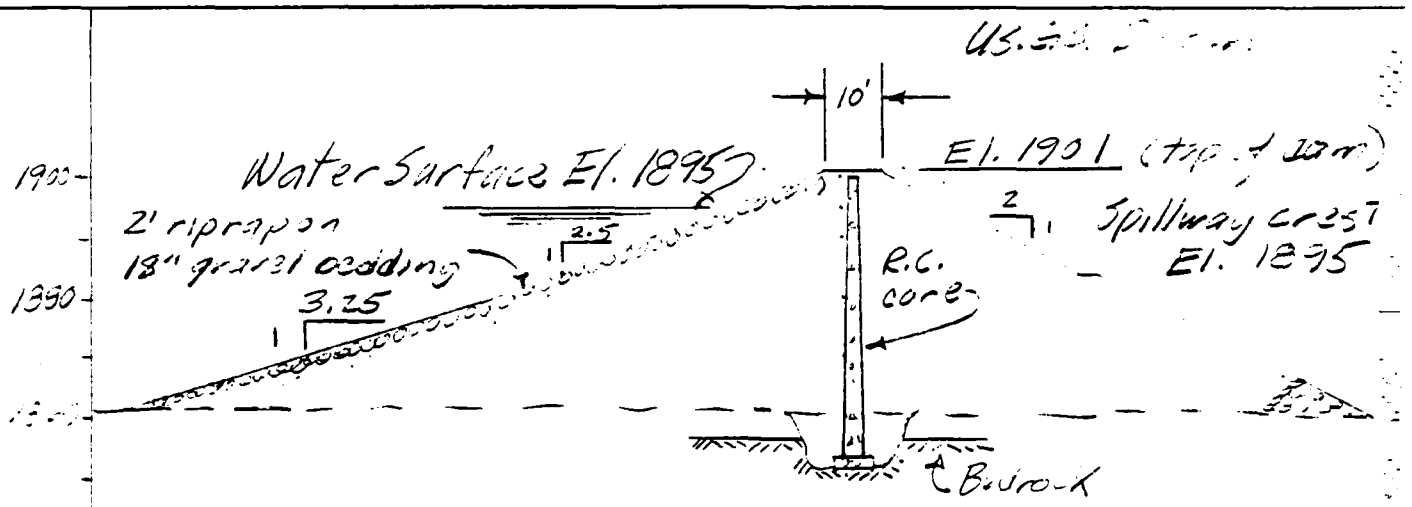
Test flood outflow uses 50% of spillway capacity.

The spillway has no provisions for flashboards.

B NO. 73205.1001
TE 2/17/21
WE
D BY MA

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. D-3
JOB D.a.
SUBJECT Emergency
CLIENT —



Storage Capacity

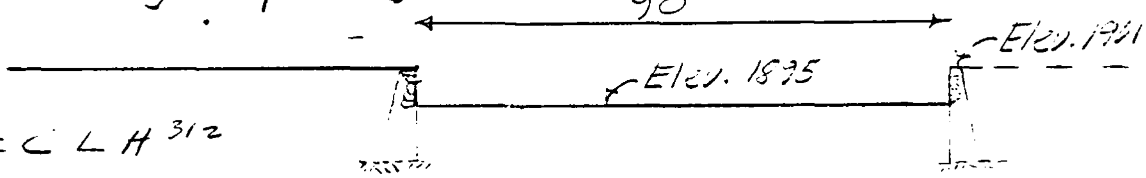
Elev.	Area (acres)	Height (ft)	Acre-ft.	Accum. A-F.
1895	65.22	5		804.49
			302.03 ✓	
1890	55.59	"		502.46
			242.40	
1885	41.37	"		259.06
			154.93 ✓	
1880	20.60	"		105.13
			73.53	
1875	8.81	"		31.60
			26.40	
1870	1.75	"		5.2
			5.2 ✓	
1865	.33	"		
1901	130	6		
			505	1[illegible]
1895	65.22			

NO. 7[illegible]1081
[illegible]
[illegible]
BY MA

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. D-4
JOB [illegible]
SUBJECT [illegible]
CLIENT [illegible]

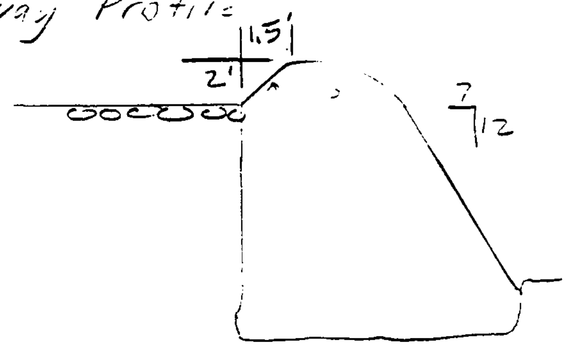
Spillway Capacity



$Q = C L H^{3/2}$

D'	C	L'	$H^{3/2}$	Qcfs
1	3.45	90	1	= 311 ✓
2	3.75	"	2.83	= 955
3	3.87	"	5.2	= 1,811 ✓
4	3.88	"	8.0	= 2,794 ✓
5	[illegible]	"	11.18	= 3,904
6	[illegible]	"	14.70	= 5,133

Spillway Profile



Spillway Section

Hazard = Significant
Size = Intermediate
Test Flood Range = 1/2 to Full PMF

Test Flood Analysis

✓ PMF Inflow = 1.7 s.m. × 2000 cfs/sm = 3400 cfs

From spillway discharge curve d = 4.5 ✓ El. [illegible]

Vol. of surcharge ($STOR_1$) = [illegible] / DA [illegible] = [illegible] acre-ft [illegible] / 1.7 [illegible] [illegible] 12 [illegible]

950

$STOR_1$ = [illegible] in.

$Q_{P_2} = 3,400 \times \left(1 - \frac{4.85}{19}\right) = 2,532$ cfs

$= 1.$

$d = 3.7$

$STOR_2 =$ [illegible] $= 7.7 - \frac{\times 12}{540} = 3.17$ in.

Ave. $STOR_1$ & $STOR_2 = (4.85 + 3.[illegible])/2 = 4.41$ in.

$Q_{P3} = 3400 \times \left(1 - \frac{4.41}{19}\right) = 2,611$ cfs

% of spillway capacity $= \frac{2611}{5133} \simeq 50\%$

79206.100
117-2-1-1
MA

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BOSTON — WEST HARTFORD

SHEET NO.
JOB
SUBJECT
CLIENT

Dam Failure (checked w/ 2 sections)

1. Sta Hill on Dam $Q_F = 8/27 (0.4 \times 56\pm) \sqrt{\frac{32.2}{5.67}} (46)^{1.5}$

$Q_{F_1} = 9,887$ cfs

2. Sta Brook on Dam $Q_{F_2} = 8/27 (0.4 \times 227\pm) \sqrt{\frac{32.2}{5.67}} (46)^{1.5}$

$Q_{F_2} = 47,718$ cfs (Use this ✓)

Hazard Class is Significant ✓

impacts 3 roads & 1 house by 1± ft. of water.

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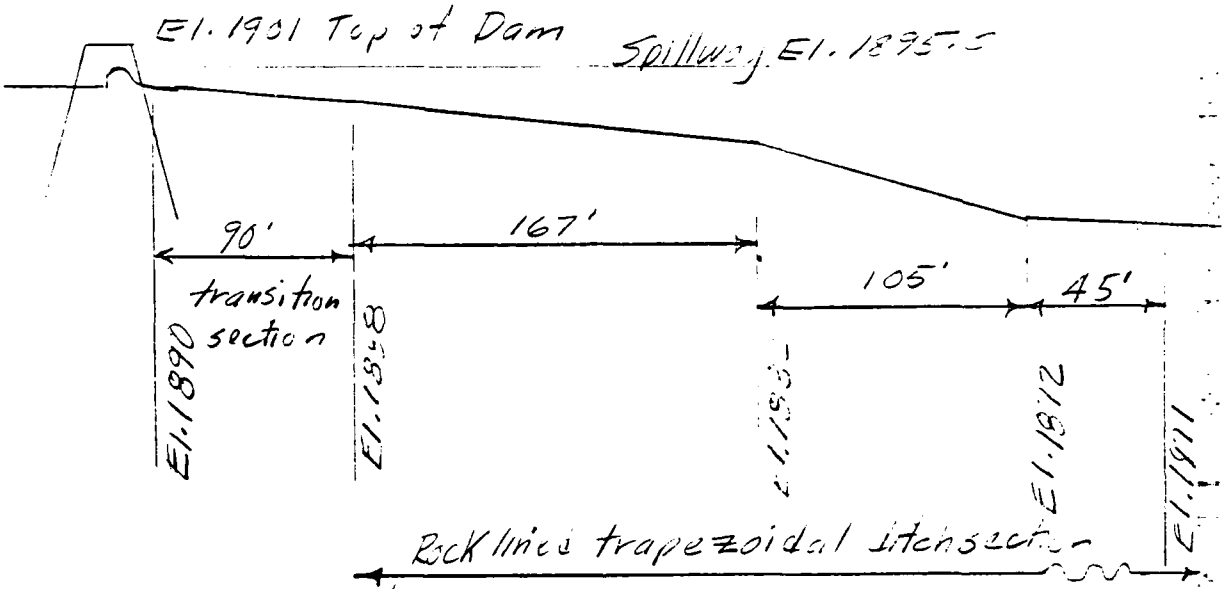
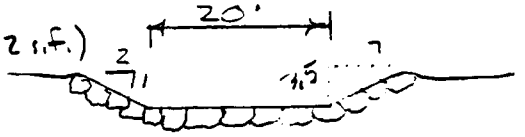
SHEET NO
JOB
SUBJECT
CLIENT

Outlet Channel Capacity (Spillway)



Min. depth

El. of Bottom 1870 to 1872 4' (112 s.f.)
" " 1872 to 1882 3'
" " 1882 to 1888 3.5'



Ditch Section

Qmax from El. 1871 to 1872

$$S = \frac{1}{45} = .0222'/'$$ ✓

$$V = \frac{1.486}{.04}\left(\frac{112}{38}\right)^{2/3}(.0222)^{1/2} = 11.4 \text{ f/sec}$$ ✓

2.06

$$Q = VA = (11.4)(112) = 1277 \text{ cfs}$$ ✓

Max. discharge rate over spillway to Elev. after section ...

7206.1911
12-24-21
M A

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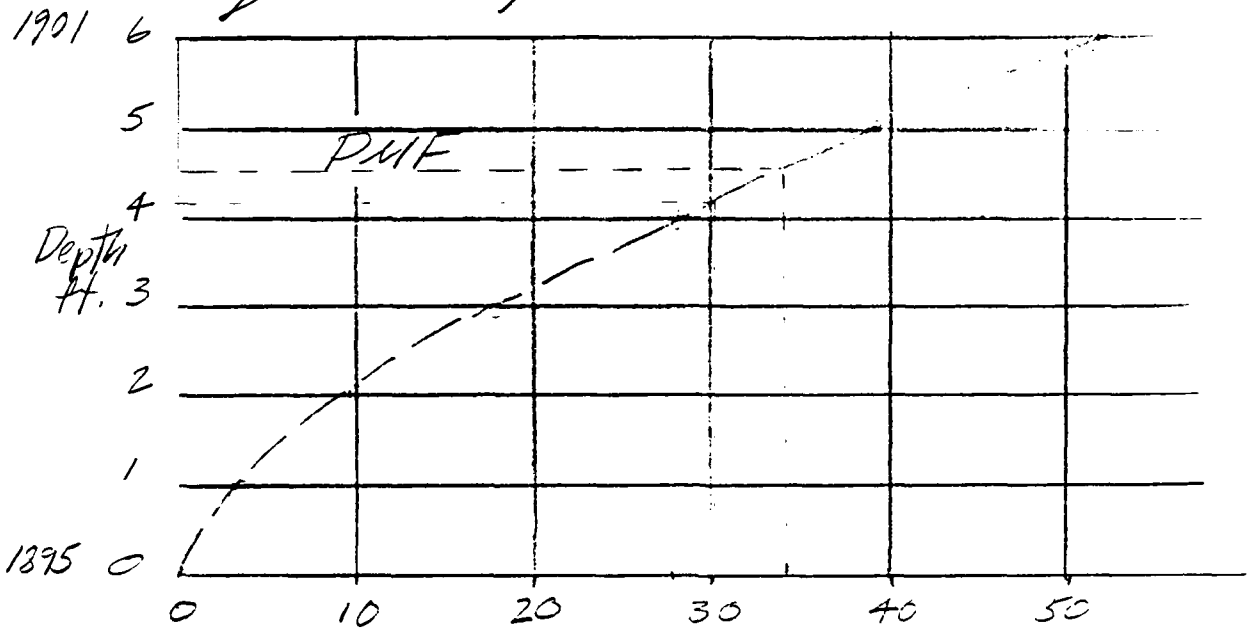
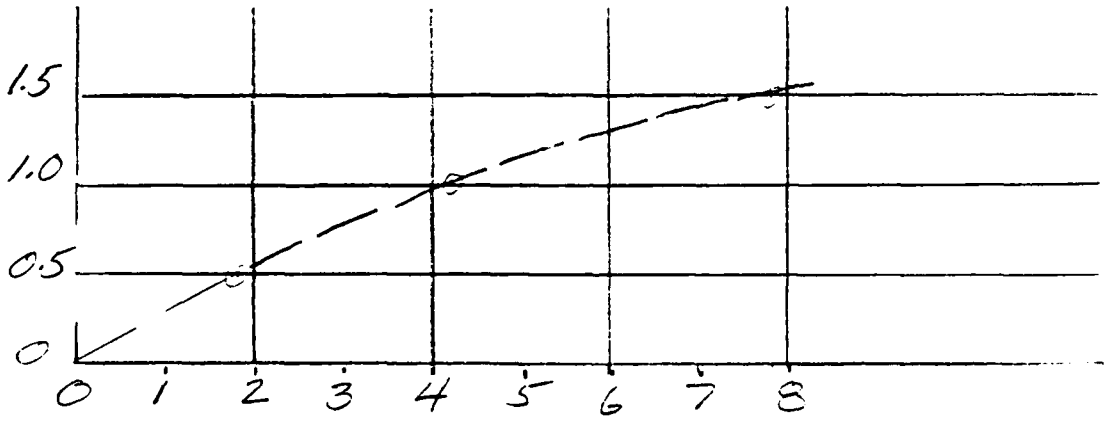
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. 5-
JOB Dam
SUBJECT Discharge
CLIENT CLE

Stage Discharge



Spillway Discharge x 100 = cfs



Dam Overflow Discharge

(Overflow does not occur)

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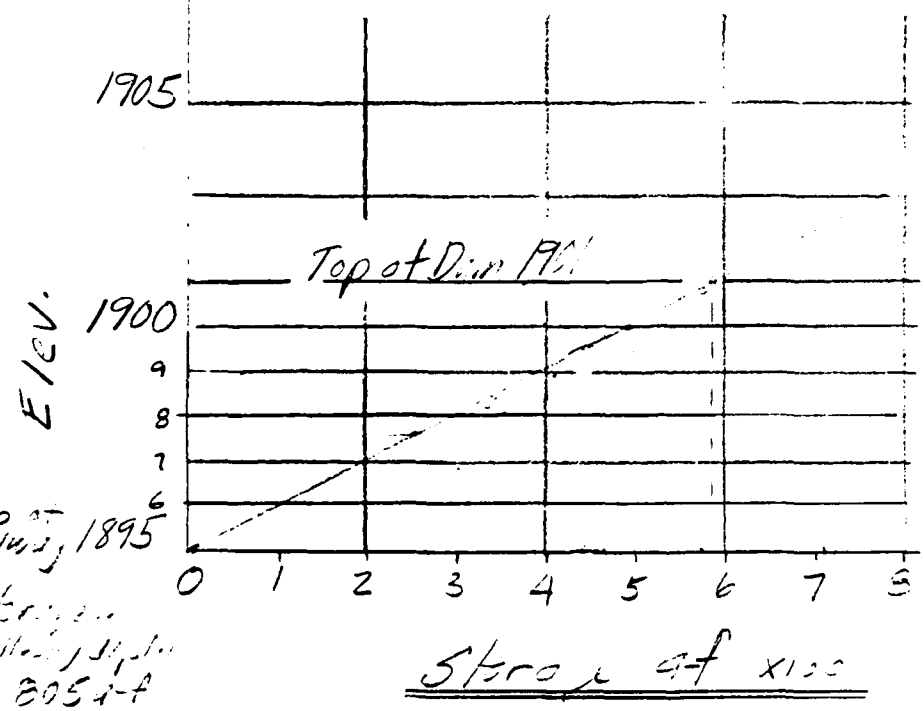
SHEET NO.
JOB
SUBJECT
CLIENT

Stage Storage.



93.1031
-24181
N/A

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CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. C-
JOB D-
SUBJECT
CLIENT C.V.E.

Dam Failure Flood Routing Analysis

Sta. 3+00

Q_{p1} = 47,718 (max dam failure flow)

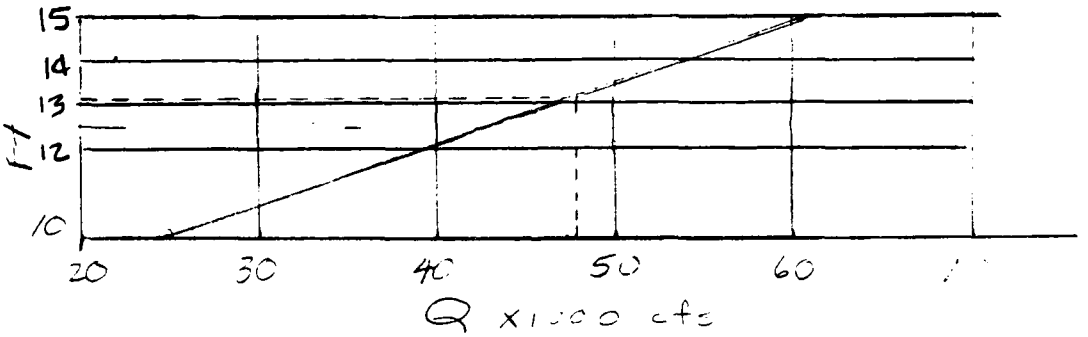
$S = \frac{37,300}{} = .123\ \%$ ✓ $S^{1/2} = .35$ ✓

$V = \frac{1.49}{n} R^{2/3} S^{1/2}$; $n = .06$; $R = \frac{A}{WP}$; $S^{1/2} = .35$

Brook

$\frac{8.67}{\frac{1.49}{.06} \times .35}$ ✓

D	WP	A	R/S	V	Q
15	220	1838	8.81 ✓	52.99 ✓	63,002 ✓
10	162	700	3.18 ✓	27.6 ✓	24,822 ✓
8	150	600	2.53	21.95	15,174
5	105	325	2.13	18.48	6,007



Reservoir Storage-Discharge at time of failure: $\frac{2.25}{5.15}$ / 1390 ✓

Q_{p1} = 47,718 J = 13.1

$Q_{p2} = 47,718 \left(1 - \frac{1038}{1390}\right)$ = 47,362 ✓

J = 13.1

$Q_{p3} = 47,718 \left(1 - \frac{10.38}{1390}\right)$ = 47,3[illegible] cfs

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SHEET NO. -
JOB Dam -
SUBJECT Flood Wall -
CLIENT CLE

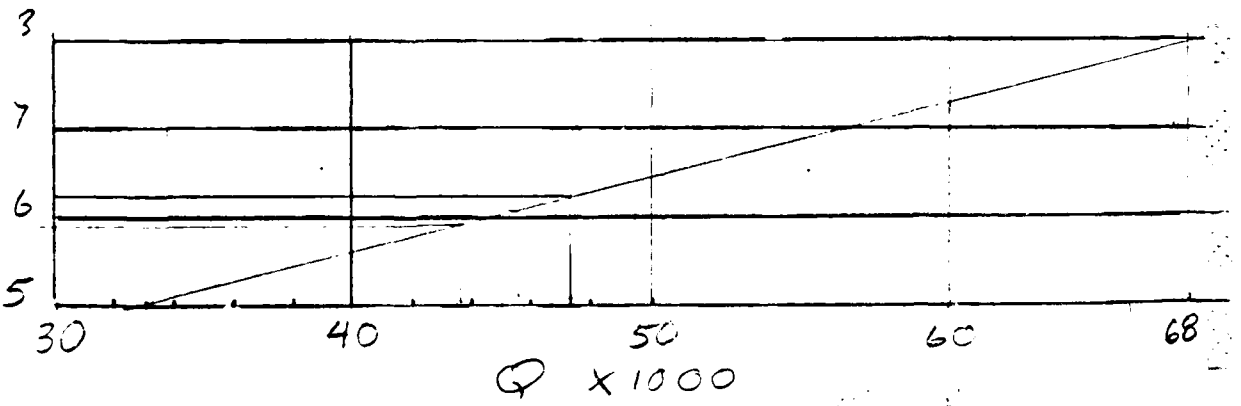
Sta 15+00

$Q_{p1} = 47,362$ cfs ✓

$V = \frac{1.486}{.06} R^{2/3} S^{1/2} = .114$ ✓

$V = \frac{1.486}{.06} (.114) R^{2/3} = 2.58 R^{2/3}$

D	WP	A	$R^{2/3}$	$(2.58 R^{2/3})$	V	Q
8	1410	8190	3.25 ✓	2.58	8.39	68,681 ✓
5	1270	5083	2.53 ✓	2.58	6.52	33,172 ✓
3.5	1200	3120	1.83	2.58	4.71	14,695
2	780	1014	1.19	2.58	3.07	3,119
1.5	600	720	1.13	2.58	2.92	2,100
1	420	336	.86	2.58	2.22	746



$Q_{p1} = 47,362$ ✓ $d_1 = 6.2$ ✓ $\frac{(1480 + 1270)}{2} \times 120 = 1$ ✓

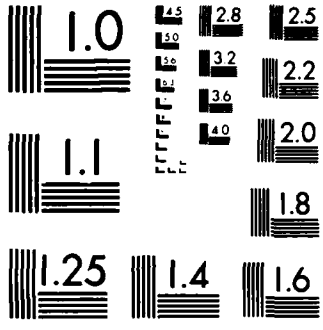
$Q_{p2} = 47,362 \left(1 - \frac{110}{1340}\right) = 43,614$ ✓

$d = 5.9$ $S_{f2} =$ [illegible] a/c. 109

$Q_{p2} = 47,362 \left(1 - \frac{109}{1340}\right) = 43,624$ ✓

AD-A154 549 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 2/2
SANDWASH DAM (MA 0031.. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV AUG 81

UNCLASSIFIED F/G 13/13 NL



JOB NO. [illegible]
DATE 7/17-24/91
BY WE
CH'D BY MA

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

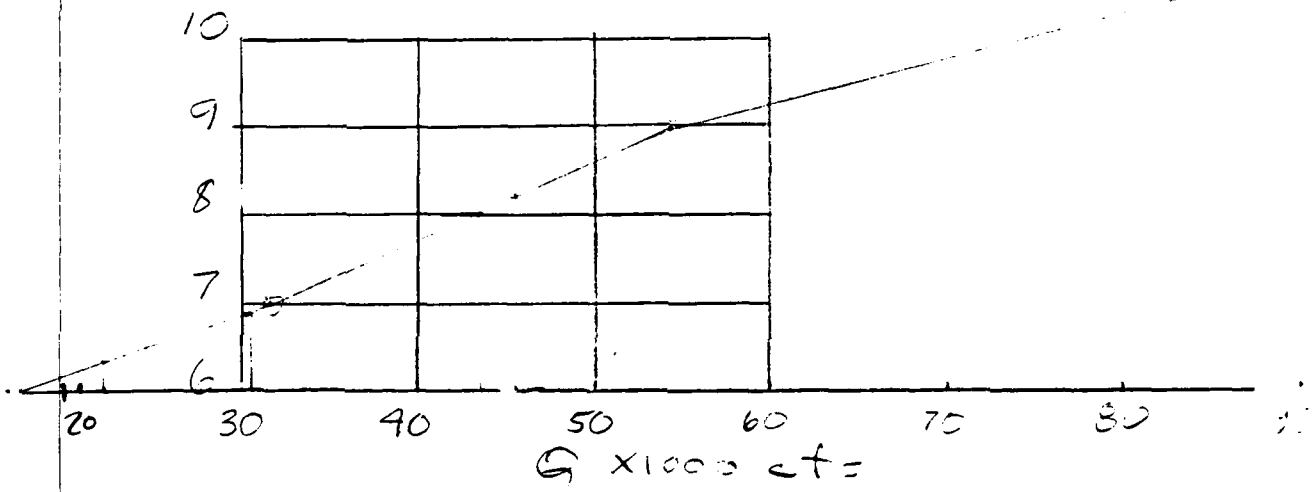
SHEET NO. [illegible]
JOB [illegible]
SUBJECT [illegible]
CLIENT [illegible]

Sta 60+00

$Q_{p1} = 43648$ $S = \frac{15}{450} = .033$ $S^{1/2} = .058$ ✓

$V = \frac{1.486}{n_s}(.058)R^{2/3} = 1.44R^{2/3}$ ✓

D	WP	A	$R^{2/3}$	1.44	V	Q
6	1050	4520	2.66 ✓	"	3.83 ✓	[illegible] ✓
7	1100	6600	3.32 ✓	"	4.78 ✓	31,553 ✓
9	1250	9600	3.92 ✓	"	5.64 ✓	54,144. ✓
11	1300	12,500	4.80	"	6.91	93,256



$Q_{p1} = 43,648$ $d = 8.0$ ✓ A = from station 0345
A station [illegible] 69.3
V = 6623 x 45 ÷ 4500 = 6.64 ✓

$Q_{p2} = 43,648\left(1 - \frac{684}{1393}\right) = 22,169$ ✓

$d = 6.4$ ✓ [illegible] 695 ✓

Ave = 6.45 ✓

$Q_{p2} = 43,[illegible]\left(1 - \frac{645}{1393}\right) = 23,394$ ✓ cf

JOB NO. 70[illegible]
DATE 7/17-24/81
BY WE
CH'D BY MA

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. [illegible]
JOB [illegible]
SUBJECT [illegible]
CLIENT [illegible]

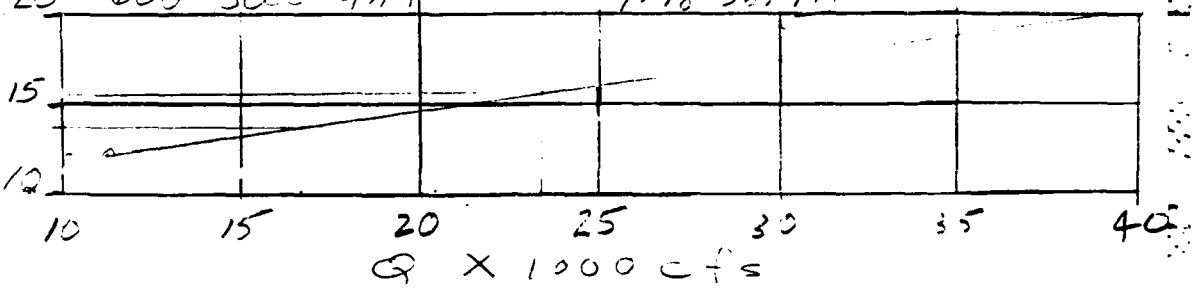
Sta 100+00

$Q_{p1} = 23,394$ cfs ✓

$V = \frac{1.486}{.036} R^{2/3} S^{1/2}$; $S = \frac{(12.5-10)}{4000} = .00575$; $S^{1/2} = .076$ ✓

$V = \frac{1.486}{.035}(.076) R^{2/3} = 1.81 R^{2/3}$ ✓

D	WP	A	$R^{2/3}$	1.88 V	Q
10	150	1200	4.03	"	7.57	9,020
12	210	1560	3.13 ✓	"	7.21	11,240
20	600	5000	4.14 ✓	"	7.78 ✓	38,911 ✓



$Q_{p1} = 23,394$ $d = 15.5$ ✓ $ST = \frac{[illegible]}{2} \left(\frac{4000}{43560}\right) = 399$ ✓

$Q_{p2} = 23,394 \left(1 - \frac{399}{1390}\right) = 16,677$ ✓

$d_2 = 13.7$ $ST_2 = \frac{[illegible]}{2}$ 368 Ac. 345

$Q_{p3} = 23,394 \left(1 - \frac{382}{1370}\right) = 16,965$ cfs

JOB NO. 79206.1001
DATE 7/17-24/1
BY
CH'D BY MA

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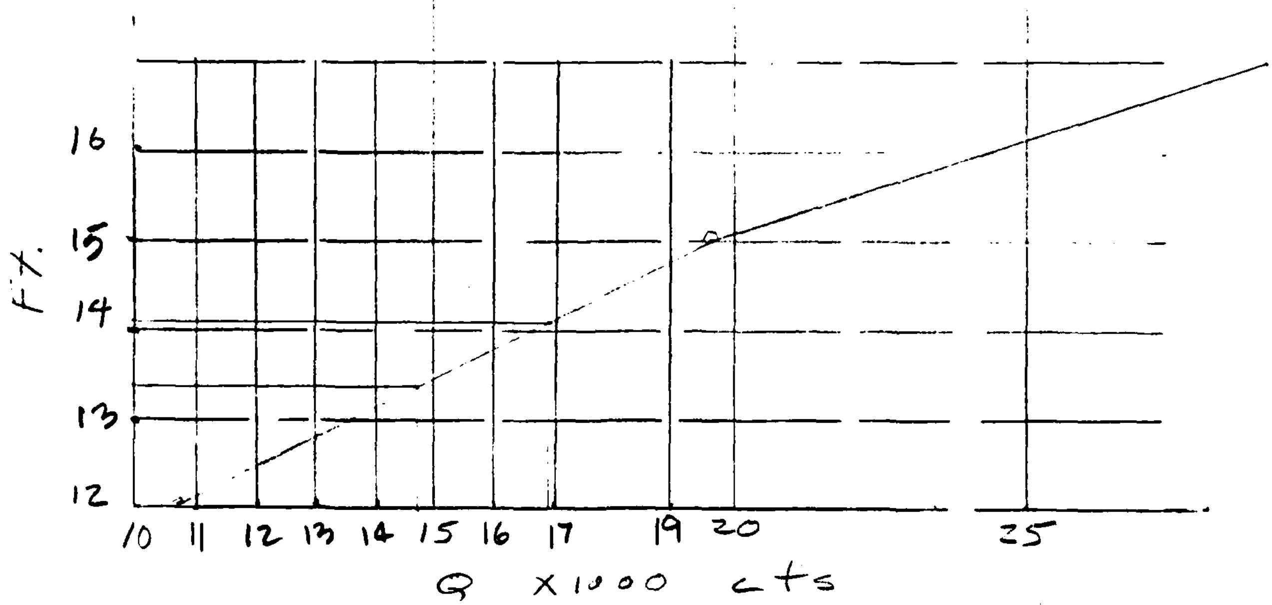
SHEET NO.
JOB
SUBJECT
CLIENT

Sta 140+00

$Q_{p1} = 16,965$ $V = \frac{1.486}{.06}$ $S = \frac{120}{4...}$ $S^{1/2} = .17$

$V = 4.28 R^{2/3}$

D	WP	A	$R^{2/3}$	4.28	V	Q
5	[illegible]	[illegible]	4.39	"	18.79	3,757
10	145	625	2.66	"	11.39	7,119
15	236	1395	3.29 ✓	4.28	14.08 ✓	19,635 ✓
12	176	864	2.9	"	12.43	10,738
17	245	1785	3.78	"	16.19	28,903



$Q_{p1} = 16,965$ $d = 14.1$ ✓ $ST_1 = \frac{26.06+...}{2}\left(\frac{4}{4.446}\right) = 13$ ✓

$Q_{p2} = 16,965\left(1 - \frac{183}{1390}\right) = 14,731$ cfs $d = 13.4$

ST 10.7

Avg. 17.0

$Q_{p3} = 16,965\left(1 - \frac{176}{1390}\right) = 14,817$ cfs

JOB NO. 79265.1021
DATE 2/17-24/81
BY WE
CH'D BY WA

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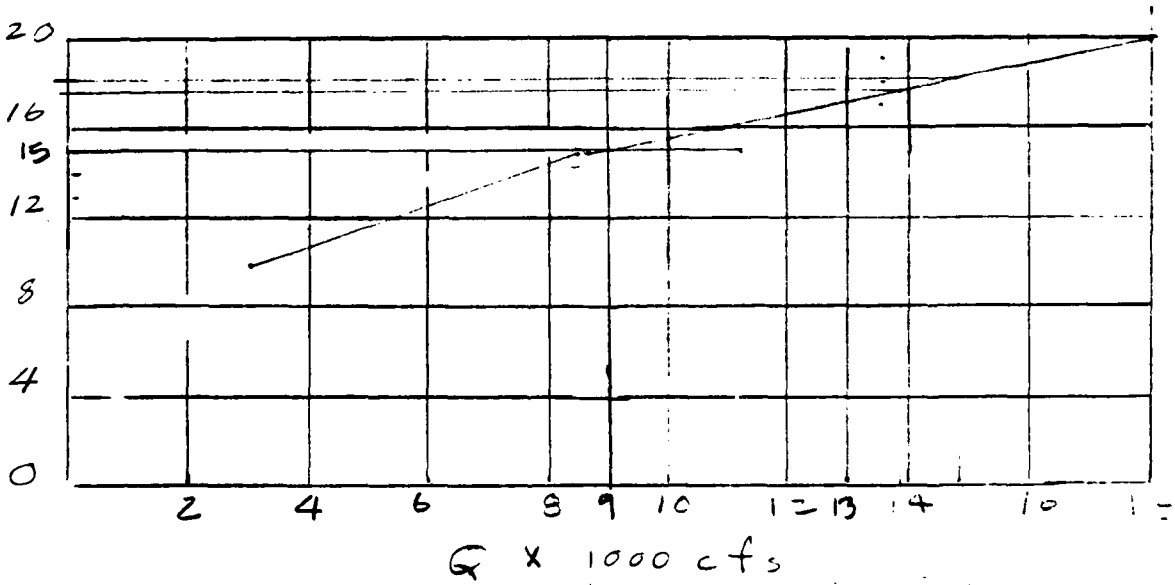
SHEET NO. D-[illegible]
JOB Dam
SUBJECT [illegible]
CLIENT [illegible]

Sta 190 T=0

$Q_{p1} = 14,817$ ✓ $S = \frac{1680-1326}{500} = .70$ ✓ $S^{1/2} = .26$ ✓

$V = 6.59\ R^{2/3}$

D	WP	A	$R^{2/3}$	6.59 ✓ V	Q
10	41	175	2.64	17.39	3045
20	79	660	4.15 ✓	6.59 ✓ 27.33	18,035
15	60	375	3.41	22.50	8,436



$Q_{p1} = 14,817$ ✓ $d = 18.1$ ✓ ST. $552 + 1335 \left(\frac{5000}{43560}\right) = 94$ ✓ a-f

$Q_{p2} = 14,817 \left(1 - \frac{94}{1390}\right) = 13,715$ ✓ cfs

$d = 17.6$ $ST_2 = \frac{1335 + 500}{2} = 91$ ave = 92

$Q_{p3} = 14,817 \left(1 - \frac{92}{1390}\right) = 13,836$ cfs

JOB NO. 7926.1001
DATE 7/17-24/81
BY LE
CH'D BY MA

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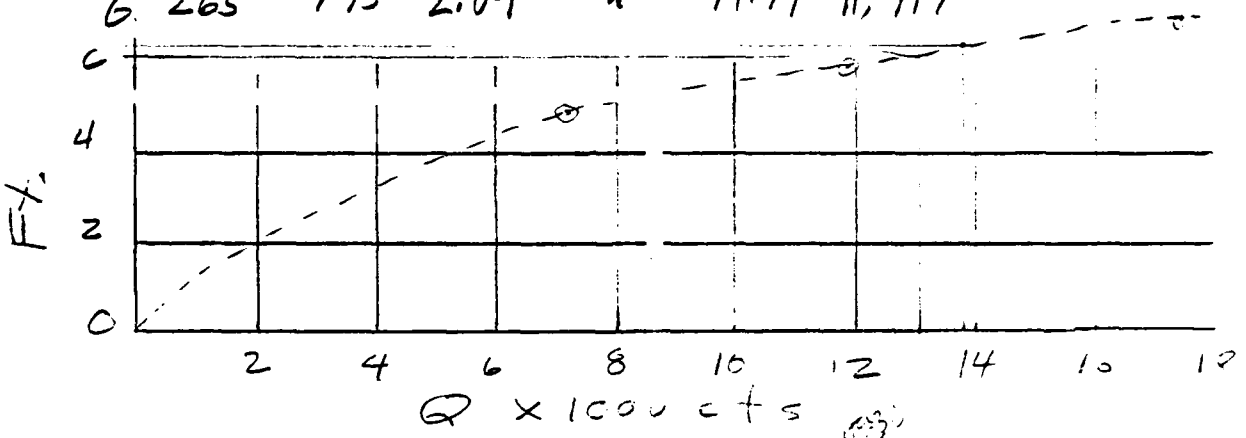
SHEET NO. 5-
JOB Pier
SUBJECT
CLIENT CofE

Sta 230+00

$Q_{p1} = 13,836$ cfs $\quad s = \frac{1326-992}{4000} = .084; \; s^{1/2} = .29$

$V = 7.18 R^{2/3}$

D	WP	A	$R^{2/3}$	7.18	V	Q
10	455	2275	2.94	"	21.11	48,023
5	220	550	1.85	"	13.26	7,296
7	300	1050	2.31	7.18	16.62	17,451
6	265	795	2.09	"	14.99	11,917



$Q_{p1} = 13836 \quad d = 6.4$ ✓ $\quad st. = \frac{797+500}{(2)}\left(\frac{4000}{4250}\right) = 64$

$Q_{p2} = 13836\left(1 - \frac{64}{1390}\right) = 13200$

$d = 6.2$ ✓ $\quad st = \frac{850+500}{(2)}(\;) = 62$

$Q_{p3} = 13,836\left(1 - \frac{63}{1340}\right) = 13,210$ ±

JOB NO. 79206.1101
DATE 7/17-24/81
BY LE
CH'D BY MA

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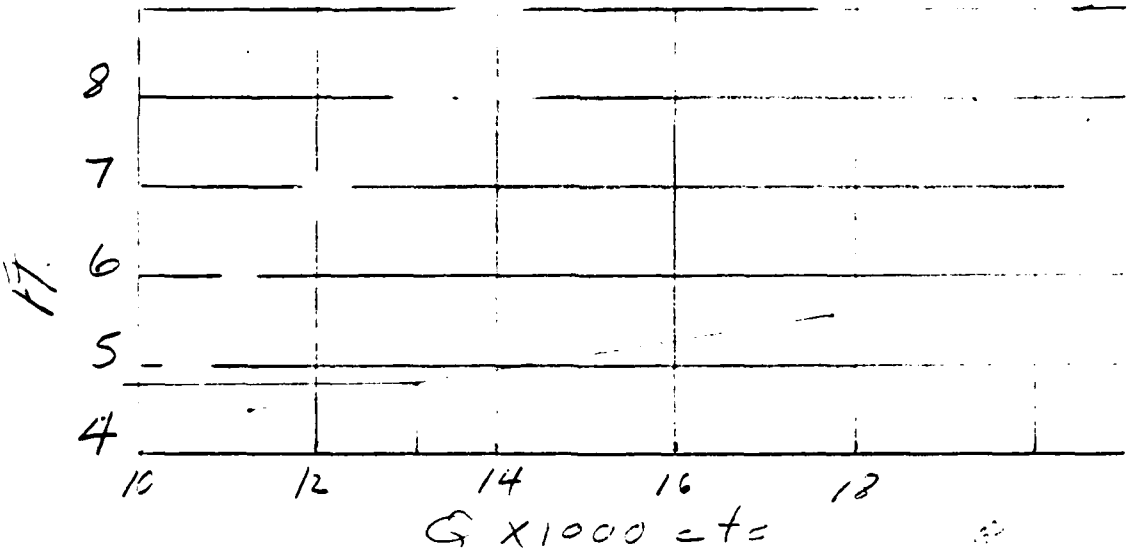
SHEET NO.
JOB Dam
SUBJECT Inlet W.
CLIENT C / E

Sta 232+00

$Q_{p1} = 13,210$; $S = \frac{14 - 10}{200}$; $S^{1/2} = .265$

$V = 6.56 R^{2/3}$

D	WP	A	$R^{2/3}$	6.56	V	Q
5.6	510	1335	1.95	"	12.77	17,71=
4	150	310	1.63		10.69	3,307
4.4	335	856	1.71		11.2	9,591
4.5	450	1005	1.11		11.28	11,200



$Q_{p1} = 13,210$ $d = 4.8$ $A = 1105$ $ST_1 = \frac{1105 + 850}{2} \left(\frac{200}{43560}\right) =$ 4.48±

$Q_{p2} = 13,210 \left(1 - \frac{4.5}{10}\right) = 13,167$ cfs

$d = 4.8$

$Q_{p3} = 13167$ ± cfs

Impacts Octoher Mtn Rd and at least 1 house depth at least 1 ft.

79206.1001
17-34181
WB

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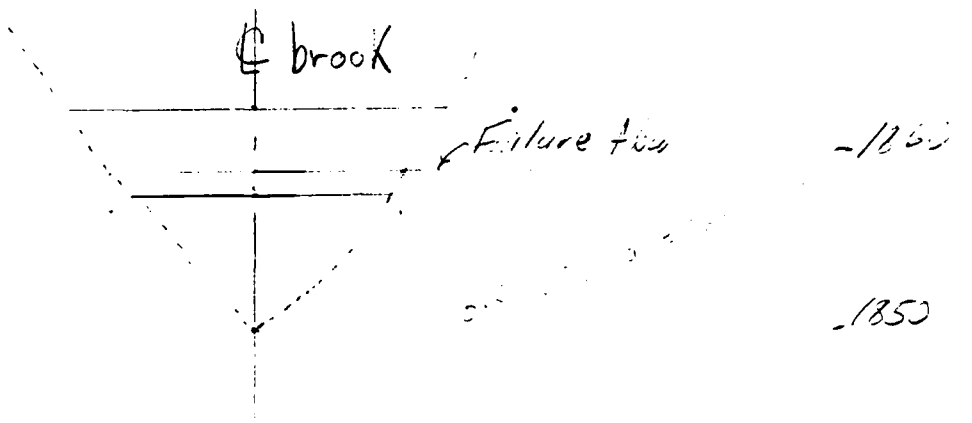
BOSTON — WEST HARTFORD

SHEET NO.
JOB
SUBJECT
CLIENT

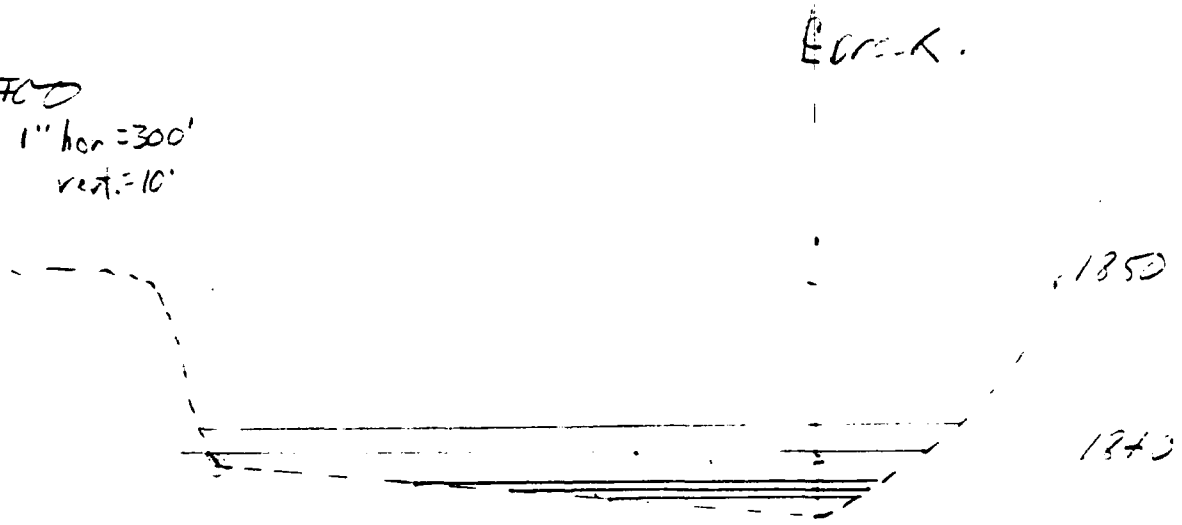
Sta 3+00

scale 1" hor = 100'
ver. = 10'



Sta. 15+00

scale 1" hor = 300'
vert. = 10'



NO. 7920.1.001
E 710-24/81
WE
BY MA

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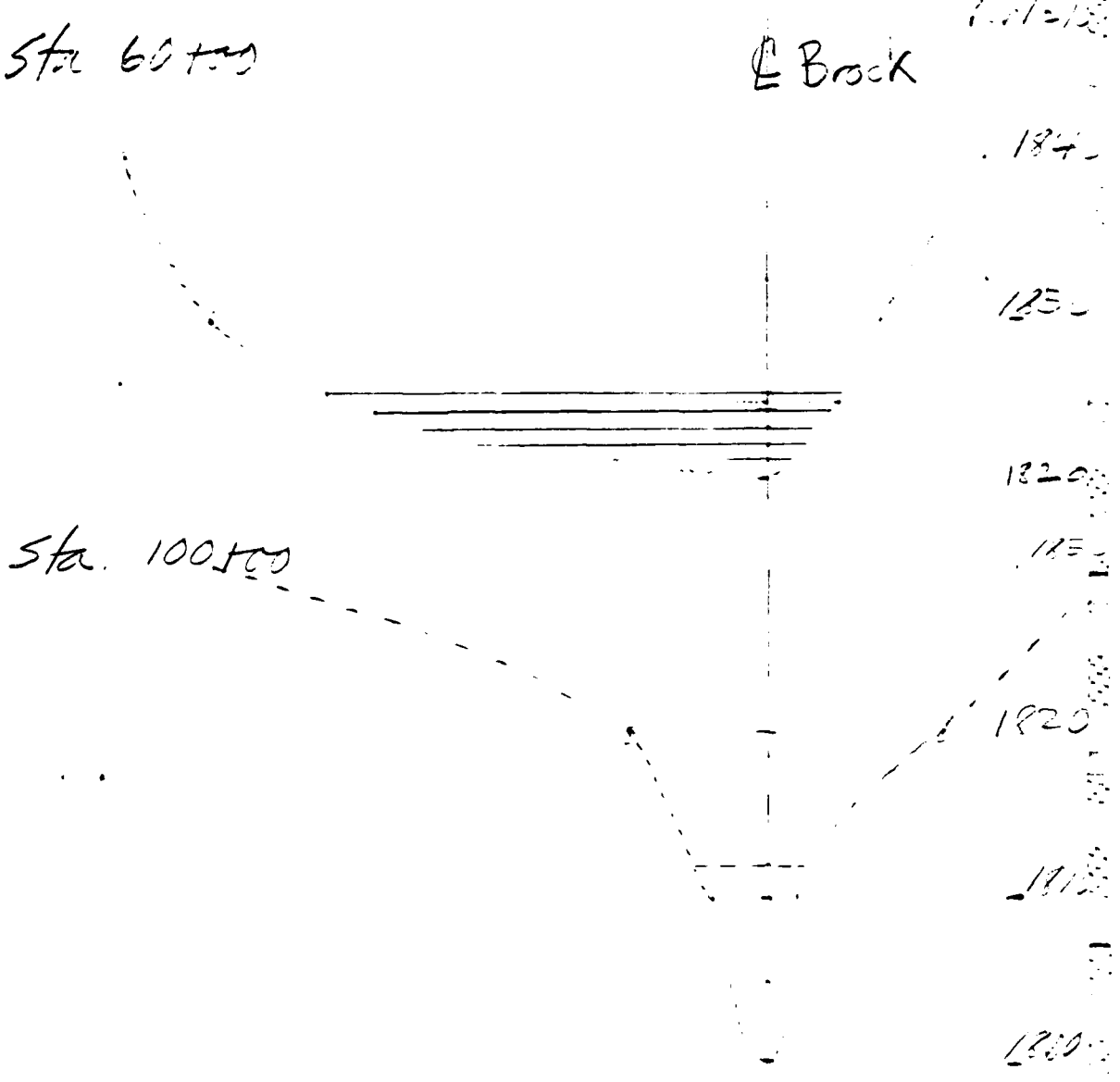
BOSTON — WEST HARTFORD

SHEET NO.
JOB
SUBJECT
CLIENT

Scale Horiz. 1"=10'



9256.101
11-24-31

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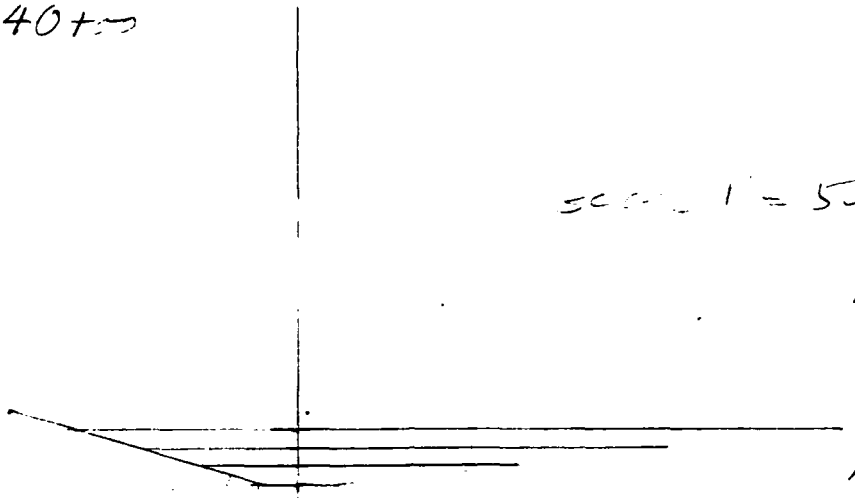
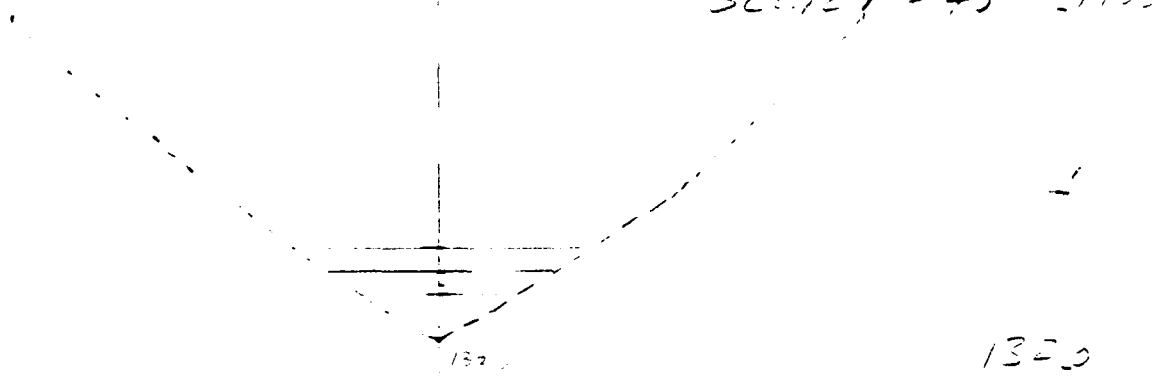
BOSTON — WEST HARTFORD

SHEET NO. 22
JOB Dam
SUBJECT Spillway
CLIENT C.V.E.

Sta 140+00



Sta 190+00



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BOSTON — WEST HARTFORD

SHEET NO. 7-21
JOB
SUBJECT
CLIENT

Sta. 230+00

Scale Hor 1"=
Vert 1" = 10'

℄ brook

1010

1000

990

Sta. 232+50 (Exist. house location)

Hor 1" =
Vert 1" = 10'

El 978±

970

HH&B HAYDEN, HARDING & BUCHANAN, INC
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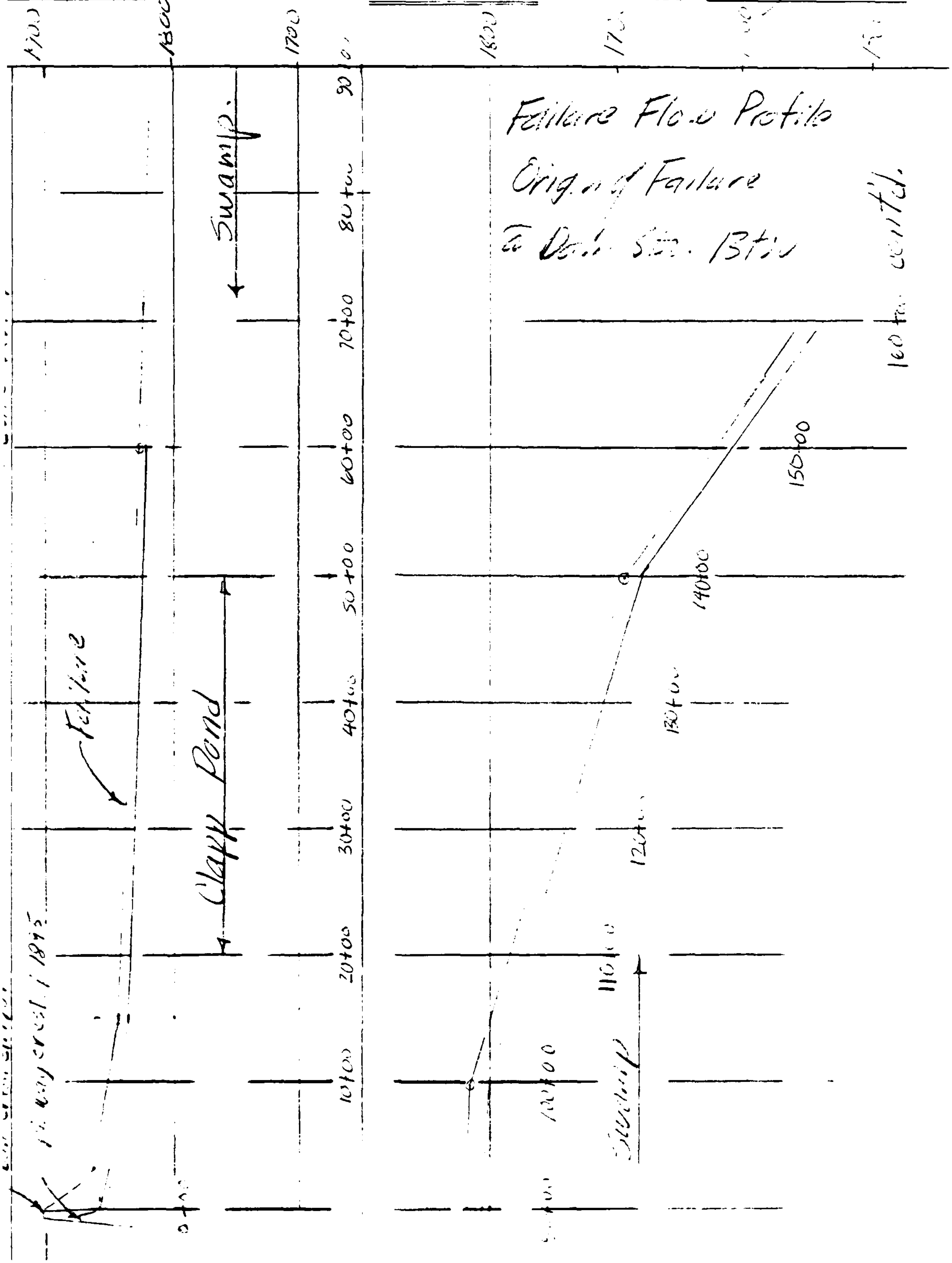
BOSTON — WEST HARTFORD

SHEET NO. D-2?
JOB ___
SUBJECT ___
CLIENT ___

27 / / / ?

111A



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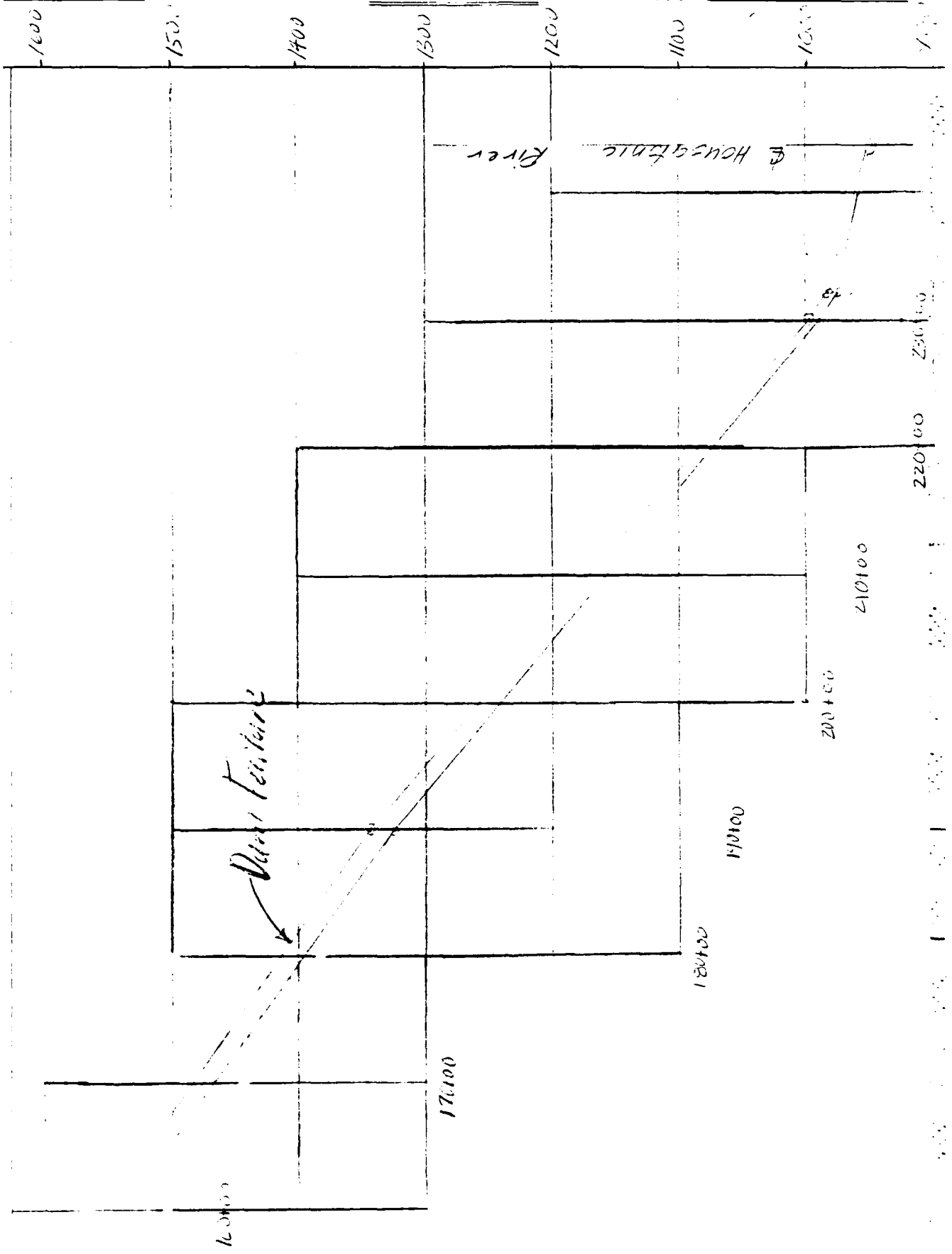
BOSTON — WEST HARTFORD

SHEET NO.
JOB
SUBJECT
CLIENT



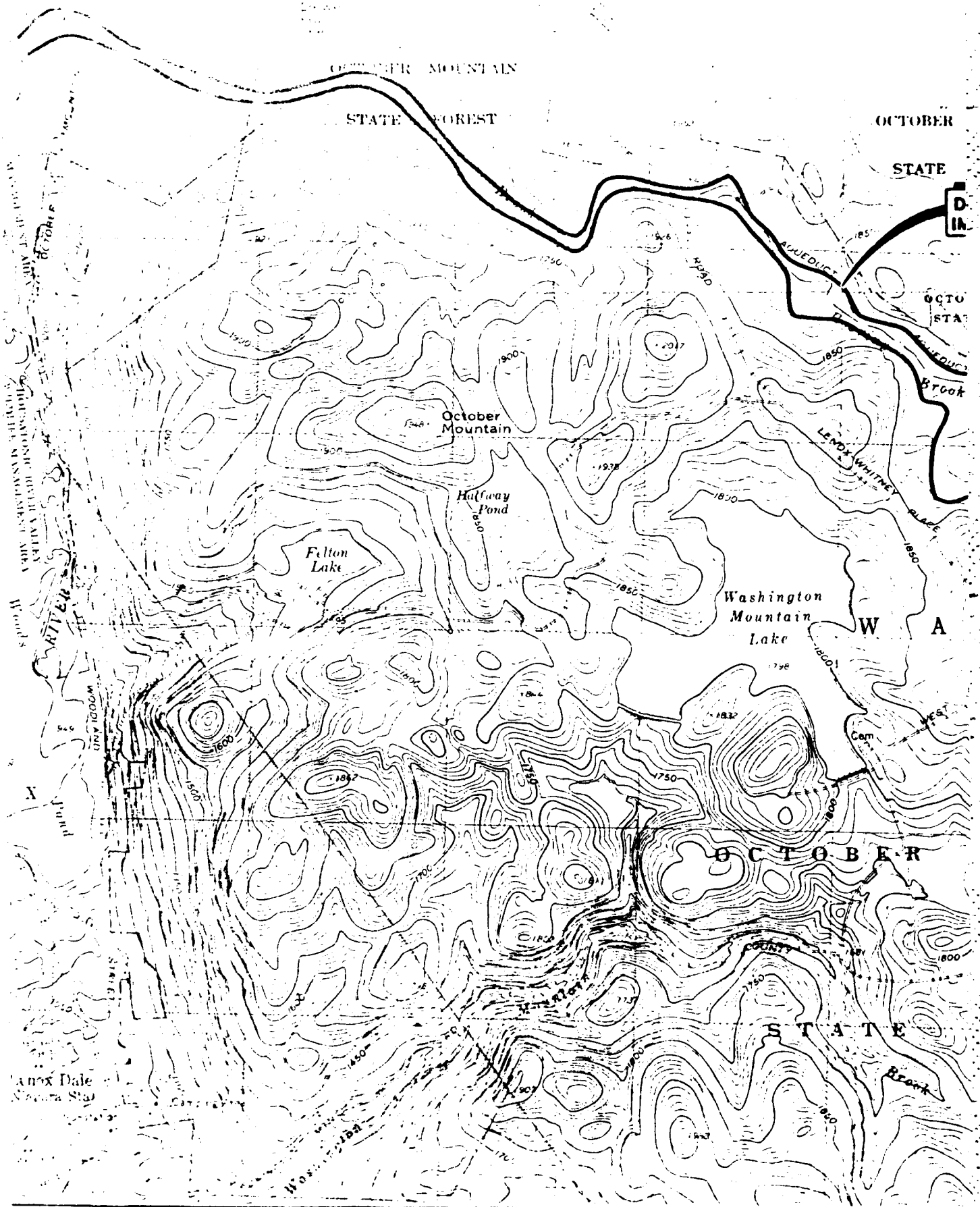
JOB NO. 7920.1121
DATE 12/21/21
BY [illegible]
CH'D BY MA

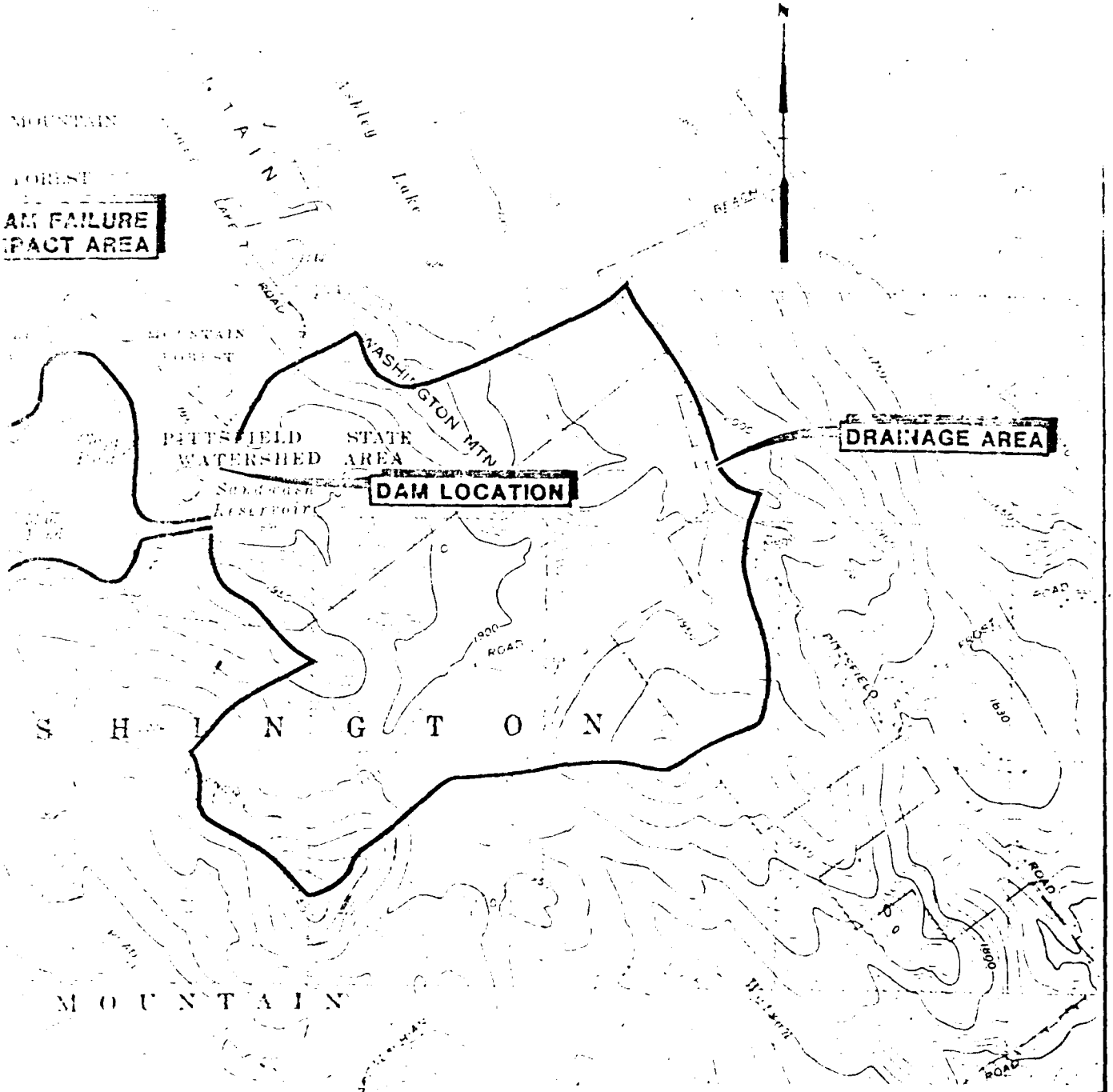
HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. D-4
JOB [illegible]
SUBJECT [illegible]
CLIENT [illegible]

Station	Elev.	Flood Water Surface Elev.
C+00	*1860	1791
3+00	1850	1863.1
15+00	1837	1842.9
60+00	1821	1827.4
100+00	1800	1813.7
140+00	1680	1693.4
190+00	1326	1343.6
230+00	990	996.2
232+00	976	980.4
243+00	950	952.0 Housatonic River

* Invert of Tunnel at downstream face





HAYDEN, HARDING & BUCHANAN, INC CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

SANDWASH DAM
DAM FAILURE IMPACT & DRAINAGE AREA

WASHINGTON MASSACHUSETTS

			SCALE
			DATE OCT. 98

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME

END

FILMED

7-85

DTIC